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ABSTRACT

Published previously as six separate books, this revised manual contains lesson plans for over 300 K-12 environmental education experiences. Four activity sections follow an introductory chapter on the philosophy, model, and implementation guidelines for the "people-environment interaction" perspective upon which these activities focus. The Concept Activities and Understandings section provides lessons on five major concepts basic to the development of environmentally literate citizens: ecosystem, population, economics and technology, environmental decisions, and environmental ethics. In the Skill Developing Activities chapter, experiences that foster development of eight environmental problem-solving skills are offered. Strategies to help students examine their environment-related values comprise the section on Values Clarification Activities. The Environmental Encounters section contains a series of activities for studying and solving environmental problems in schools and communities. Lessons in all four of these activity sections are identified by grade level. Concluding the manual is a chapter listing titles and sources of numerous environmental education resource materials. (WB)

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ENVIRONMENTAL EDUCATION ACTIVITIES MANUAL

Prepared and Edited by

William B. Stapp, Ph.D.
Chairperson, Behavior and Environment Program
School of Natural Resources
University of Michigan
Ann Arbor, Michigan
and
Former Chief, Environmental Education Unit
United Nations Educational, Scientific and Cultural Organization (Unesco)
Paris, France

and

Dorothy A. Cox, M.S.
Environmental Educator
Clarenceville Public Schools
Farmington Hills, Michigan
and
Consultant, Department of Defense
Dependent Schools of Europe

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FOREWORD

In these times, it is important to continue to protect and improve the environment in which we live. Our present society has become very aware of and concerned about the environment. Steps are being taken to improve it. Eternal vigilence is needed, and a well educated population is the best insurance for its preservation.

A comprehensive environmental education program is essential to our future, and schools accept the responsibility for the education of our children and youth. It is through active participation, year by year, kindergarten through the twelfth grade, that the quality of living will improve in our villages, towns, and cities. The young are making a great impact with their ideas and their concerns for the future of the world.

This publication will provide valuable resources to teachers and curriculum specialists as they construct a viable environmental education program for their students. Contained here is not an array of "hothouse" ideas but actual activities which have taken place in the classrooms. They include many important contributions coming from students, teachers, and community members.

For the past four years, students at all grade levels and in many diverse community settings throughout the City of Toledo have been involved in the program. Significant resources have been contributed by the University of Michigan, but the activities described here have had the test of actual field experience.

Lee R. McMurrin
Deputy Superintendent
Toledo Public Schools

August, 1974

PREFACE

The environmental education philosophy and model presented in this manual have been developed over a period of ten years. During this time, different aspects of the environmental education model were developed, introduced into one or more school systems, and shaped into its present form.

The material in this manual was produced in response to student and teacher demand for material to support the environmental education model described in this book. The activities in the manual were developed largely in writing workshops by teachers familiar with the environmental education model. Most of the activities were used in the classroom and modified according to student-teacher responses. Most of the activities are original creations designed to assist the learner in acquiring specific knowledge, skills, or learning processes.

Special recognition should be given to the following individuals for the vast amount of time and effort spent in helping to produce this material: Diane Boyd, Jo Ann Burgess, Judy DuShane, Glen Erickson, Mary Graham, Margery Harris, Tim Lozen, George Moore, Ann Sibole, Talbert Spence, Michael Teeley, Ellen Vande Visse, and Richard Wilhite. Recognition should also be given to the following public school systems for sponsoring teacher-student workshops to help produce the following materials: Dearborn Public Schools, Oak Park Public Schools, Toledo Public Schools, Utica Public Schools, and the Ralph MacMullen School of Conservation.

We are also deeply indebted to Carl Berger, Bunyan Bryant, Jim Crowfoot, and Paul Nowak for their visionary thinking, creative suggestions and valuable insights as we have modified our approach over the past ten years.

We are very appreciative of the effort of Ms. Lori Mann and the School of Natural Resources Service Center for typing this manual. We would also like to recognize the full support and assistance of Gloria Stapp and Jim Cox in helping to edit the manual and for providing invaluable services throughout the task of producing this manual.

We hope that you will find this manual helpful and that it will assist you to successfully integrate environmental education into your classroom, school system, or organization.

William B. Stapp
Dorothy A. Cox

October, 1979

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SECTION I

AN INSTRUCTIONAL PROGRAM APPROACH TO ENVIRONMENTAL EDUCATION (K-12) -BASED ON AN ACTION MODEL-

SECTION I

AN INSTRUCTIONAL PROGRAM APPROACH TO ENVIRONMENTAL EDUCATION (K-12)

-BASED ON AN ACTION MODEL-

A. The Philosophy of Environmental Education

1. The Basic Concept

We share space in a narrow band of land, air, and water on the surface of the third planet from the sun. Included in that space are all the resources we will ever have. We are a closed system run by the radiant energy from the sun.

We are members of one of the many populations of living species on the planet Earth which, like all populations, live, and consume resources, and die. But, unlike any other species, we have developed an economic system using a technology which has consumed vast amounts of resources, brought rapid environmental changes, and overloaded the environment with waste. We have developed the potential to destroy ourselves.

By our decisions and actions we determine the quality of our environment. We have an obligation to our generation and future generations to preserve a quality of life that we perceive to be necessary for a healthful, productive existence for all people.

2. The Definition

> Environmental education is a process aimed at developing a world population that is aware of, and concerned about the total environment and its associated problems, and which has the knowledge, attitudes, motivations, commitments and skills to work individually and collectively toward solutions of current problems and the prevention of new ones.

3. The Emerging Philosophy

Attitudes toward the environment are generally acquired very early in life, and to change an attitude takes a very strong and reinforcing environment. Therefore, educational programs must start early and transcend both formal and non-formal education.

As we enter the 80's, we must realize that the world population is becoming more urban. The land, once plentiful, is now becoming more developed. Large and middle sized communities, many within complex urban regions, have evolved to where a large percent of our population is residing on a smaller percent of our land surface. Consequently, the independent rural oriented living that once characterized our social and political heritage is no longer a dominating influence in most of our lives. With a higher percent of the people living in urban communities, the term "environment" has come to include city life and its surroundings -- and rightfully so. Therefore, greater attention should be given to community environmental problems, such as: air, water, and noise pollution; traffic congestion; urban decay; environmental health problems; indiscriminate use of pesticides; housing problems; and the lack of institutional arrangements needed to cope effectively with these environmental problems. To resolve these problems requires a more responsible performance from everyone -- whether that "one" be citizen, corporation, or government.

We need to identify and develop educational programs that focus on the causes of the environmental crises, rather than just the symptoms (see figure 1). It is apparent that we will be facing today's environmental problems in the future, and "breeding" new ones, until we identify the causes of our environmental crises and develop comprehensive action programs to resolve them.

Some important causes of our environmental crisis may rest in our present consumer (individual) and corporate behavioral patterns, and the lack of environmental policies (or enforcement of existing policies) and priorities that are responsive to an emerging ethic where people live compatibly with their environment.

It is vital that we question our present life styles. People of all ages need to examine their way of life to determine the degree to which it reflects a commitment both to protect and to enhance the environment. As an example, people should be active in solving traffic congestion both through the political process and by walking, bicycling, or using rapid transit rather than cars. If cars must be used, driving pools should be formed. As consumers, stockholders, voters, and advocates, people can help establish sound environmental policy in various ways. Specifically, they can ask informed questions, at the proper time and of the right people. They can boycott a product and campaign for others to do likewise.

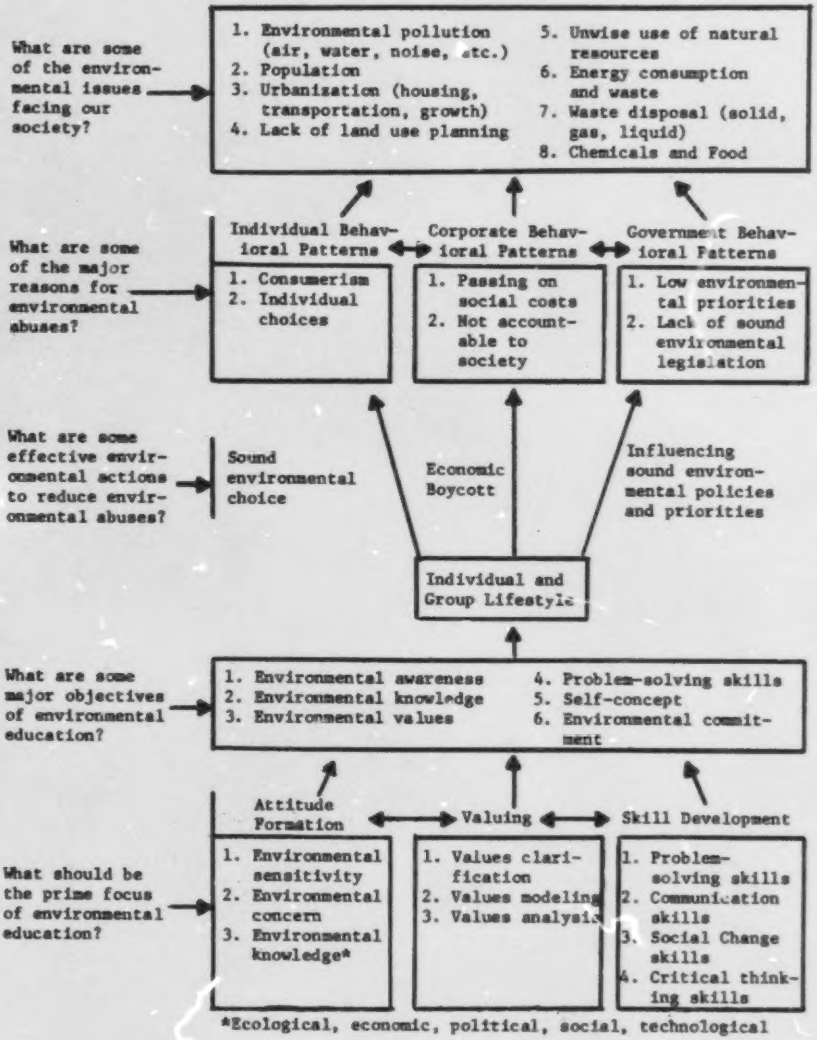
What are some of the environmental issues facing our society?
1. Environmental pollution (air, water, noise, etc.)
2. Population
3. Urbanization (housing, transportation, growth)
4. Lack of land use planning
5. Unwise use of natural resources
6. Energy consumption and waste
7. Waste disposal (solid, gas, liquid)
8. Chemicals and Food
What are some of the major reasons for environmental abuses?
Individual Behavioral Patterns
1. Consumerism
2. Individual choices
Corporate Behavioral Patterns
1. Passing on social costs
2. Not accountable to society
Government Behavioral Patterns
1. Low environmental priorities
2. Lack of sound environmental legislation
What are some effective environmental actions to reduce environmental abuses?
Sound environmental choice
Economic Boycott
Influencing sound environmental policies and priorities
Individual and Group Lifestyle
What are some major objectives of environmental education?
1. Environmental awareness
2. Environmental knowledge
3. Environmental values
4. Problem-solving skills
5. Self-concept
6. Environmental commitment
What should be the prime focus of environmental education?
Attitude Formation
1. Environmental sensitivity
2. Environmental concern
3. Environmental knowledge*
Valuing
1. Values clarification
2. Values modeling
3. Values analysis
Skill Development
1. Problem-solving skills
2. Communication skills
3. Social Change skills
4. Critical thinking skills
*Ecological, economic, political, social, technological

FIGURE 1: SYMPTOMS VS. ROOT CAUSES OF THE ENVIRONMENTAL CRISIS

They can serve on advisory and policy-making committees. They can support and be advocates for sound legislation directed at resolving environmental problems. People can make decisions as they cast votes on environmental issues, as they elect representatives to policy-making bodies, as they act directly upon the environment itself.

The foundation for strong environmental action rests, to a large degree, on what happens in our homes, schools, youth programs, church, community, media, and interest groups. Each of these has a particular role to play in the education of the individual. Today's youth will soon be the citizens and voters whose decisions will affect not only the immediate environment in which they live, but also that of their nation and other parts of the world. They will make the choices and directly or indirectly by their behavior cast the votes about recreation, transportation, beautification, water needs, and control of air and water pollution. Therefore, it is imperative that our educational systems develop comprehensive environmental education programs so that our youth and adults will be more sensitive to their environment, better able to recognize environmental problems, more sophisticated in the utilization of problem-solving skills essential to the solution of emerging environmental problems, and more inclined to participate in coping with these problems. People should understand the importance of relating ecological, economic, social, technological, and political information when working toward the solution of environmental problems.

B. Major Constraints to Developing, Implementing, and Evaluating an Environmental Education Program (K-12)

Many constraints confronting environmental education are not unique -- they are inherent in the American educational system. It is vital for environmental educators to identify these constraints and team with fellow educators to help solve common problems. Four major constraints that need to be recognized and recommended remedies are discussed below.

First, as the learner proceeds from kindergarten through the twelfth grade, educational material is increasingly organized around disciplines and little emphasis is placed on interdisciplinarity. This presents a constraint because environmental education is an interdisciplinary, problem-solving appraoch. This constraint may be difficult to overcome for some time, as the problem-solving approach may need to become an integral part of collegiate education before it can be successful at the elementary and secondary levels.

Second, curricula are already crowded with subject matter material; hence it is difficult to persuade administrators to infuse additional areas of study into the school day. However, this situation can be countered by indicating that environmental education can link subject matter fields and reinforce the existing curriculum. Environmental education can also provide relevance for existing curricular material.

Third, environmental education cannot avoid value questions. However, many public schools have steered clear of open value discussions, particularly those that run counter to community norms and attitudes. Environmental education advocates a values clarification and analysis process. This process does not teach a particular set of values. Rather, it stimulates an individual to examine her or his behavior by clarifying and analyzing for herself or himself her or his purposes, beliefs, attitudes, and other value indicators.

Fourth, there is a severe shortage of classroom teachers prepared to effectively integrate environmental education into instructional programs. The traditional approach to the teaching of environmental matters has been for the teacher to become knowledgeable about some aspect of the environment and then convey this information to the student through the lecture approach. This process has not been highly effective in stimulating sustained interest in environmental affairs or in helping students acquire beliefs, attitudes, values, or skills conducive to the development of an environmentally literate citizenry. Several leading environmental educators have advocated an approach whereby the teacher provides opportunities and encourages class members to investigate their community environment in an effort to reinforce classroom material and to provide a working knowledge of the human ecosystem. This represents a departure from a "read and discuss" method. Class members view the environment first-hand, attend public hearings, gather relevant information, consider alternative solutions to problems, and advocate solutions through appropriate channels. The teacher's role is not to just lecture about the environment but to assist class members in acquiring information relevant to their environmental concerns.

Other constraints affecting the success of environmental education programs are: inflexible scheduling; resistance and apathy on the part of the community, administrators, teachers, or learners; youth oppression; lack of community reinforcement of parents, youth groups, peers, and church; funding constraints for transportation, materials, facilities, or personnel; lack of information on the learner's community environment, such as government, housing, solid waste, power generation, water pollution, air pollution, noise pollution, waste water treatment, transportation, and recreation; or the lack of information for the teacher in carrying out an environmental education program, such as the role of the teacher and learners, and guidelines for handling values clarification, controversial topics, or social change strategies.

These constraints are typical of most school systems. All education programs should be periodically evaluated, problems identified, and strategies outlined to overcome the constraints. Many of the problems confronting an environmental education program are similar to those affecting the success of other instructional programs. For this reason, coalitions of administrators, teachers, learners, and community citizens should be formed to find ways to overcome mutual problems and to meet the needs of youth.

C. Strategy for Curriculum Development, Implementation, and Evaluation in Environmental Education (K-12)

To overcome the constraints outlined above, it is imperative that strategies for curriculum development, implementation, and evaluation be developed. The following is a strategy that has been effective in establishing comprehensive environmental education programs in some existing school systems:

Phase 1: Establish a committee to develop, implement, and evaluate the environmental education program and to facilitate communication (p. 9-10)

Phase 2: Establish environmental education goals that the environmental education program will be designed to strive toward (p. 10)

Phase 3: Establish environmental education objectives that the program will be designed to achieve (p. 11)

Phase 4: Review the literature regarding theories of learning, instruction, and attitudes and behavioral change to serve as guiding principles in the formulation, implementation, and evaluation of the environmental education program (p. 11-12)

Phase 5: Establish program goals to help achieve stated environmental education goals and objectives (p. 13-14)

Phase 6: Establish the curriculum (instructional model) of the environmental education program (p. 14-22)

- Part A: Philosophy and concepts — big ideas (p. 14-15)
- Part B: Skill development (p. 15-16)
- Part C: Values clarification (p. 16-17)
- Part D: The environmental encounter (p. 17-18)
- Part E: Emphasis of program at different age levels (p. 18)
- Part F: Teaching and learning models (p. 19-20)

Part G: Sensitivity guidelines for learners entering a community to work on local environmental problems (p. 21-22)

Part H: Handling controversial issues in the classroom (p. 22-23)

Phase 7: Establish a comprehensive in-service teacher education program (p. 23-27)

Phase 8: Develop a reinforcing environment (p. 27)

Phase 9: Strategy to overcome program constraints (p. 27-28)

Phase 10: Develop instruments to evaluate the effectiveness of the environmental education program (p. 29)

Each of these phases will be developed in detail below.

Phase 1: Establish a committee to develop, implement, and evaluate the environmental education program and to facilitate communication.

The introduction of an environmental education program requires the involvement and preparation of the community, administration, teaching staff, students, and the school supportive staff. This can be accomplished by establishing a committee to develop, implement, and evaluate the environmental education program to facilitate the communication.

The environmental education committee should include administrators, teachers from various grade levels and subjects, students, local officials and citizens representing various community interests.

Important duties of an environmental education committee are to:

a. Assist in the development of the philosophy and operating structure of the program;

b. Identify the changes needed to fully implement the program;

c. Develop a strategy to implement the program;

d. Implement the program;

e. Administer the program;

f. Maintain effective communication both within the school system and between the school system and community;

g. Evaluate the effectiveness of the program in achieving stated goals and objectives.

In developing an environmental education program for a school system, an environmental education coordinator or facilitator* should be obtained. The coordinator or facilitator provides the leadership and guidance essential to the success of the program. The coordinator or facilitator might be the person to convene the environmental education committee.

Phase 2: Establish general environmental education goals that the environmental education program will be designed to strive toward.

Without a clear statement of goals, a program would become a series of unrelated experiences, focusing on limited program objectives.

A general goal of environmental education that a program might strive toward:

GOAL STATEMENT:** To develop a citizenry that is aware of, and concerned about, the total environment, and its associated problems, and which has the knowledge, attitudes, motivations, commitment, and skills to work individually and collectively toward solutions of current problems and the prevention of new ones.

SUBGOAL STATEMENTS: To achieve the above goal, structures and processes are needed to help individuals and groups:

a. Obtain an understanding that people are an inseparable part of an environmental system and that whatever they do alters their surroundings in both harmful and beneficial ways.

b. Obtain a basic knowledge of how environmental problems can be solved, and recognize the responsibility of individuals and each segment of society to cooperate in their solution.

c. Develop analytical, thinking and action skills for understanding, preventing, and helping to correct environmental abuses.

---

*Some school systems or districts have employed a full time teacher (environmental education coordinator) whereas others have relieved one of their teachers (environmental education facilitator) of several classes or for half day periods of time, to help develop and carry out their environmental education program.

**Goal of Environmental Education as adopted at the World Intergovernmental Conference on Environmental Education, Tbilisi, USSR, October 14-26, 1977.

Phase 3: Establish specific environmental education objectives that the program will be designed to achieve.

Listed below are objective categories around which a school system could develop a series of definitive (measurable) objectives. The Environmental Education Committee of a school system should first define its environmental education goals (Phase 2) and then state measurable objectives in the affective, cognitive, and skill-behavior domains to achieve its goals. Categories that should be considered while developing objectives toward which the environmental education program should be directed are:

Objective Categories:*

a. Awareness -- to help individuals and social groups acquire an awareness of and sensitivity to the total environment and its allied problems;

b. Knowledge -- to help individuals and social groups gain a variety of experiences with the total environment and to acquire a basic understanding of the total environment, its associated problems and humanity's critical responsible presence and role in it;

c. Attitudes -- to help individuals and social groups acquire social values, strong feelings of concern for the environment and the motivation for actively participating in its protection and improvement;

d. Skills -- to help individuals and social groups acquire the skills for working toward the solution of environmental problems and to foster a dialogue between these groups; and

e. Participation -- to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to help solve these problems.

Phase 4: Review the literature regarding theories of learning, instruction, and of attitude and behavioral change to serve as guiding principles in the formulation, implementation, and evaluation of the environmental education program.

A recent review of the literature reveals the following points that should be considered in the formulation, implementation, and evaluation of the environmental education program.

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*Objective categories as adopted at the World Intergovernmental Conference on Environmental Education, Tbilisi, USSR, October 14-26, 1977.

a. Behaviors that are positively reinforced are most likely to recur. Desired behaviors should be reinforced by the home, school, church, youth organizations, and so on.

b. The most effective effort is put forth when learners try tasks that fall in the "range of challenge" -- not too easy and not too hard -- where success seems likely but not certain.

c. Learners are most likely to throw themselves whole-heartedly into any project if they themselves have a meaningful role in the selection and planning of the enterprise.

d. Reaction to excessive direction of the teacher is likely to be apathetic conformity, defiance, or escape.

e. All environmental programs should be developed systematically and application of instruction based on the learner's motivations and having due regard to his psychological development as well as the cultural environment surrounding her or him.

f. What is learned is most likely to be available for use if it is acquired immediately preceding the time when it is needed. Learning then forgetting, and then relearning when need arises is not an effective procedure.

g. The learning process in school ought to involve dynamic methods of inquiry.

h. Learning takes place through the active behavior of the learner. It is what he or she does that he or she learns, not what the teacher does. The essential means of an education are the experiences provided, not the things to which the student is merely exposed.

i. One of the keys to motivation is a sense of excitement about discovering for oneself, rather than having a generalization presented by a teacher and requiring a student to prove it.

j. Helping citizens to acquire technical knowledge alone regarding an environmental problem may not increase their concern for the problem.

k. Citizens are more likely to become involved in environmental issues if they personally believe they can have some effect upon decision-making.

l. Individual apathy can result when a person feels a lack of confidence in her or his ability to change or influence decisions. To overcome this type of apathy it is important to help an individual to see how he or she can be effective in influencing public decisions.

Phase 5: Establish guiding principles of environmental education to help achieve stated environmental education goals and objectives.

An important criticism of school systems is the lack of adequate communication between the various divisions of the school organization. Instead of well-developed series of instructional units and activities commencing at the kindergarten level and terminating in the twelfth grade, many school systems present instructional material that has little relationship between what has previously been taught and what will be taught in the future. The K-12 approach is the most sound way to plan a curriculum for environmental education.

Curriculum projects should be planned horizontally as well as vertically. Disciplines, such as science and social studies, should not be studied in isolation. They should be planned so students can utilize the contributions of interdisciplinary studies in understanding and solving environmental problems.

Furthermore, a curriculum program should recognize individual differences. No sequence meets the needs of all students. Therefore, a curriculum should be flexible so material can be presented according to background, needs, and aspirations of the students.

Some guiding principles of environmental education that educational institutions concerned about environmental education should consider are that environmental education should:*

a. Consider the environment in its totality -- natural and built, technological and social, economic, political, moral, cultural and historical, and aesthetic aspects;

b. Be a continuous life-long process; it should begin at the preschool level and continue through all formal and non-formal stages;

c. Be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective;

d. Emphasize active participation in preventing environmental problems and working toward their solution;

e. Examine major environmental issues from local, national, regional, and international points of view, so that learners receive insights into environmental conditions in other geographical areas;

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*Guiding principles of environmental education as adopted at the World Intergovernmental Conference on Environmental Education, Tbilisi, USSR, October 14-26, 1977.

f. Focus on current and potential environmental situations;

g. Emphasize the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills;

h. Utilize diverse learning environments and a broad array of educational approaches to teaching and learning about and from the environment with due stress on practical activities and first-hand experiences;

i. Focus on the learner's own community and relate topics being discussed to state, regional, national and international issues and perspectives.

j. Relate environmental sensitivity, knowledge, problem-solving and values clarification at every grade level, but with special emphasis on environmental sensitivity to the learner's own community in early years;

k. Enable learners to play a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences.

Phase 6: Establish the curriculum (instructional model) of the environmental education program.

Successful environmental education programs can be based on different models. The model described below is action oriented and encompasses many aspects advocated by leading educators. The model consists of seven integral parts: philosophy and concepts; skill development; values clarification; environmental encounters; environmental emphasis; teaching-learning models; and sensitivity guidelines.

Part A: Philosophy and Concepts (Big Ideas)

An environmental education program should be directed toward assisting the learner to fully understand certain concepts (big ideas) and supportive understanding important to the development of an environmentally literate citizenry.

Five major environmental education concepts basic to this philosophy are: ecosystems, population, economics and technology, environmental decisions, and environmental ethic (see figure 2). These concepts encompass the awareness, knowledge, and understanding of the living and non-living world and their complex interactions; the social, economic, political and aesthetic influences of the populations of people; the need for, and processes of decision making; and development of an environmental ethic which

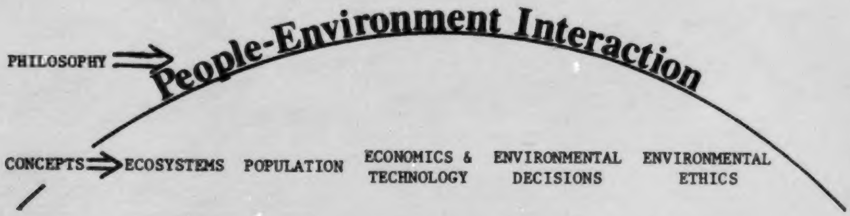


FIGURE 2: ENVIRONMENTAL EDUCATION MODEL: PHILOSOPHY AND CONCEPTS

would motivate the learner to adopt a life style compatible with environmental quality. These concepts are basic and essential and can be presented in a manner to be understood by students of all ages.

Each of the five concepts have been divided into grade level statements called understandings. These understandings outline the focus for the various grade levels within the broad concept, and serve as the base for the concept building activities, skill building activities, community problem solving activities (environmental encounters), and valuing activities found in this manual.

These understandings are cumulative. Each level builds on the understandings of the previous level. Therefore, any higher level teacher may find it desirable to adapt some of the activities from a lower level in order to develop the awareness and knowledge needed as a background for the sub-concept under consideration. An understanding of these concepts is essential in the development of environmentally literate citizens and should be considered and integrated into all areas of the curriculum.

Part B: Skill Development

To produce an environmentally literate and active citizenry, it is essential to assist the learner in obtaining skills to help resolve environmental problems, as well as environmental knowledge and a motivating concern. Since this environmental education model is based on student involvement, problem solving skills are essential to developing and carrying out environmental action plans.

Some skills important in identifying and helping to solve environmental problems are the ability to:

1. Recognize environmental problems
2. Define environmental problems
3. Listen with comprehension
4. Collect information
5. Organize information
6. Analyze information
7. Generate alternative solutions
8. Develop a plan of action
9. Implement a plan of action

Part C: Values Clarification

To understand the role of valuing in the model, it is important to realize that the philosophy, concepts, and understandings go beyond the common surface, or symptomatic activities found in some environmental education efforts. In order to solve environmental problems, it is essential that we get at the root causes -- such as the life style of each individual. A student picking up litter would be treating the symptom. Developing the concern to change a person's behavioral patterns that causes her or him to drop the litter would focus on the root causes.

In everyday life, the learner sees visible pollution (symptoms) produced by technology in its effort to create and satisfy consumer demands. Because it is easy to get caught up in consumer cycles stimulated through advertising, the learner needs to examine her or his way of living. Each learner needs to be guided through a valuing process where he or she explores the consequences of one's individual action, and where he or she learns to generate ideas for alternative behaviors that would bring her or him into a more compatible way of living with her or his environment.

A learner begins to develop one's own set of values when he or she starts to consider alternatives, the consequences of alternatives, and his or her personal feelings toward each alternative before he or she acts. The steps advocated in the values clarification process are:

1. Learners are presented with an issue.
2. Learners suggest alternative solutions.
3. Learners consider the consequences of each alternative.
4. Learners express their feelings about each alternative.
5. Learners make a free choice.

The values clarification approach helps learners become aware of personal beliefs, attitudes, values, and behaviors which they prize and are committed to both in and out of the classroom. This process assists students in considering alternative solutions and the implications of each alternative. A critical role of the teacher is to help each learner to consider whether her or his stated beliefs, attitudes and values are congruent with her or his actions.

Values clarification and analysis are of major importance in making rational environmental decisions every day of a person's life, and must be a basic part of every environmental education program. Knowing one's values also help an individual to build a greater sense of self concept.

Part D: The Environmental Encounter

The environmental concepts, problem solving skills and the values clarification process are integrated in the environmental encounter.

The environmental encounter is an instructional technique for studying the environment with an emphasis not only on the development of interest, awareness, understanding, and respect for the environment, but also on the development of problem solving and valuing skills. The learner should have the opportunity to become personally involved in positive action through the following recommended steps:

1. Define the problem or issue.
2. Become informed.
3. Identify alternative solutions.
4. Evaluate alternative solutions.
5. Develop a plan of action.
6. Implement the plan of action.
7. Evaluate the implementation.

Each encounter should contain a list of desired outcomes (behavioral objectives) which provides direction for the learning process. The second section of the encounter lists activities to be developed with learners including leading questions which will help develop the information and critical thinking desired. A third section might include a human and non-human resource list of community people and sites, and audio-visual materials available.

Some environmental encounters need not be strongly problem-oriented. For example, in the lower grades there should be an attempt to bring out basic awareness and appreciation for the environment. An investigation of the school site by a first grade class might expose the children to ecological principles. Although recognition and solution of relevant problems are appropriate for early grades, the honing of problem solving skills is more appropriate for upper grades.

One of the most important parts of the environmental encounter is the action phase. A common learner complaint is, "People always do a lot of talking but no one ever does anything." To feel effective, learners need to do something. An elementary school child who picks up litter, makes a bird feeder out of a discarded plastic bottle, makes posters to inform or remind, or writes letters to decision-makers about their concerns is doing something. A middle school or secondary school learner who gathers pertinent data and communicates it convincingly to the most effective decision-maker can effect changes and can see how he or she can be effective. An older learner, by developing an encounter and participating in community action projects, will develop and refine her or his problem solving and valuing skills.

Part E: Emphasis of Program at Different Age Levels (K-12)

Environmental education activities at each grade level should focus on the affective (feeling), cognitive (knowing), and skill-behavior domains. Emphasis in the early years, however, should be in the affective domain and in the later years on the cognitive and skill-behavior domain. However, all three of these domains should be an important component at each grade level (see figure 3). The learner should also be provided with opportunities to explore her or his immediate environment with all of her or his senses -- sight, hearing, smell, touch, and taste. The learner should be exposed to a variety of physical and social environments in order to have experiences to judge the quality of her or his immediate environment. For example, an inner-city child who has never experienced clean air, uncrowded housing, safe streets, unpolluted water, healthy trees, and rich soil may not have a quality "measuring stick" by which to judge her or his home environment. Likewise, a rural child may accept a pristine environment, not knowing that it can be degraded if people are not active in maintaining a quality environment. Similarly, each child may not see the strengths, weaknesses, and meaning of his own social environment unless he or she experiences, as far as is possible, the strengths, weaknesses, and meaning of contrasting social environments.

If a child learns to appreciate and respect environmental resources, he or she may want to learn more and be willing to protect what he or she appreciates. Many programs emphasize knowledge rather than feelings in the early years. This emphasis is less likely to produce an individual who strives for more knowledge or has a motivating concern that will result in a tendency to act if the environment becomes degraded.

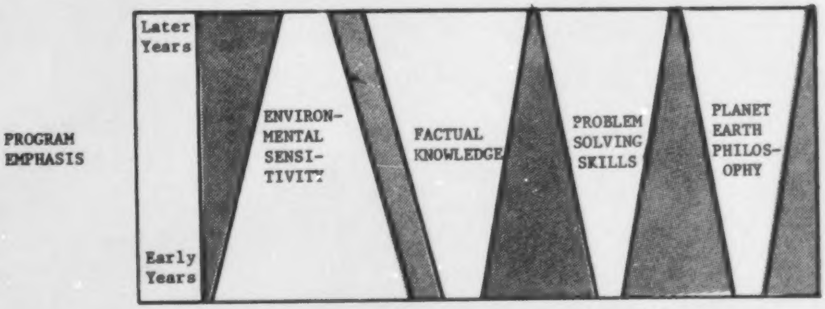


FIGURE 3: ENVIRONMENTAL EDUCATION MODEL: PROGRAM EMPHASES

Part F: Teaching-Learning Models

There is no single teaching model that all learners will respond favorably toward under all circumstances. Some learners learn best when the teacher is acting as a conveyer or information. Other learners learn best when there is an atmosphere of strong teacher-learner interaction. It is important for a teacher to assess her or his personal skills and the situation and then blend teaching models in an effort to achieve the best learning environment.

The teaching model traditionally employed in most American classrooms is characterized by a teacher who digests a predetermined body of information and then conveys this material to the learner. Such a role is illustrated by Figure 4. When the teacher functions in this role, the content and the subject matter have already been determined by publishers, committees, administrators, or a school board. The teacher becomes familiar with the content and then assumes the role of expert in conveying this information to the learner. This learner is presumed to have few attitudes or thoughts about the content until after the unit has been completed. The virtue of this model -- or teaching based on it -- is that it is neat, tight, controlled, and orderly. Its weakness is that it is not very effective in achieving the outcomes sought by the action-oriented model being discussed in this section.

The amount of information available on the environment and the recent demand of students for relevancy in educational programs calls for a teaching model where the instructor does not serve as the principle source of information. The role of the teacher is

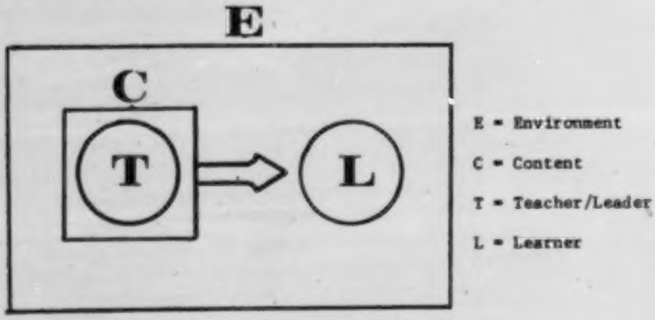

E
C
T
L
E = Environment
C = Content
T = Teacher/Leader
L = Learner

FIGURE 4: TEACHER AS CONVEYER OF INFORMATION

to create a learning environment, assist learners in acquiring information, provide guidance to the learner, and to participate with the learner in the learning process.

Research studies have shown that teachers are highly effective when they participate in learning projects as "team members," guides, and counselors, rather than as star performers. This means that many of the functions traditionally regarded as the prerogative of the teacher should be conducted by the learners. Decisions on which activities will be pursued, and by whom, should be determined by the learners, with advice and guidance from the teacher. This concept of the role of the teacher is illustrated by Figure 5.

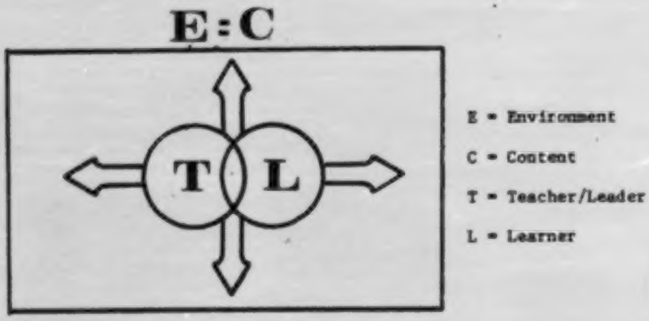

E:C
T
L
E = Environment
C = Content
T = Teacher/Leader
L = Learner

FIGURE 5: TEACHER-STUDENT INTERACTION

Part G: Sensitivity Guidelines for Learners Entering a Community to Work on Local Environmental Problems

Learners entering a community to work toward the solution of local environmental problems should receive intrapersonal and interpersonal training. It is also important that consideration be given to the process of identifying, selecting, implementing, and evaluating community action projects. It is also important to prepare the community for learners entering it to study particular problems. The following guidelines have been developed for these purposes to aid students involved in community action projects:

1. Self and resource evaluation.
    a. Be aware of their personal values (e.g., elitism-classism, racism, sexism, ageism, etc.) and arrange for training sessions to work on value conflicts.
    b. Be aware of personal values that might be different from the values of the community sector that you will be working with. Arrange for training sessions to work on value conflicts and to foster value sensitivity.
    c. Be aware of interpersonal relationships and arrange for training sessions to work on problem areas (personality barriers, working relationships, etc.).
    d. Be aware of the resources that you and each of the other members bring to the team.
2. Sensitivity toward the community.
    a. Do not enter the community like gangbusters.
    b. Be a good community listener.
    c. Do not seek to replace existing community leaders. They will be there long after you leave.
    d. Be informed about the community (the people, the government, politics, functioning of community, living conditions, environmental status, concerns of the residents, etc.).
    e. Be aware of and work with community people and organizations that have the resources and past experience to assist you in your community problem-solving project.

3. Identification of community projects.

    a. Obtain ideas from learners, faculty, school administration, citizens, government officials.

    b. Attend public hearings and meetings.

    c. Read community newspapers and newsletters.

    d. Listen to local public-affairs radio and TV programs.

4. Selection of community action projects.

    a. Review all community projects identified through process 3 (above).

    b. Make your project selection after considering items such as learner interest in project, learner and community priorities, available resources, funding, risks involved (personal, class, school, etc.), school board policy, and the social implications of the work you are planning in the community.

5. Implementing community action projects.

    a. Involve the learner; do not be leader-centered.

    b. Be a facilitator, not a commentator.

    c. Give credit where credit is due; practice humility.

    d. Be aware of the social implications of vour actions.

    e. Develop strong ties with community individuals and organizations in order to build your power base and to provide an on-going support for the project.

Part H: Handling Controversial Issues in the Classroom

The following are guidelines to be considered by the teacher in handling controversial issues in the classroom:

1. The classroom teacher must be aware of and take into account the policies of the local Board of Education regarding the handling of controversial issues.

2. The teacher should know the "times", the student body, and its cultural or sub-cultural make-up as they pertain to the issue at hand.

3. The teacher should assist pupils in identifying problems, collecting information, identifying alternative solutions, evaluating solutions, developing a plan of action, and working toward a selected solution or solutions.

4. Emphasis should be placed on considering the issue from an ecological, economic, political, social, and technological point of view.

5. The teacher should strive to bring in divergent views, references, and resource persons.

6. Emphasis should be placed on considering all aspects of a problem before making decisions.

7. Emphasis should be placed upon the fact that a student may or may not agree with another's point of view but should respect that person's right to it.

8. Before progressing into the action phase, the class should consider the social implications of any action.

The environmental education model described in Phase 6 is diagrammed in Figure 6.

Phase 7: Establishing a Comprehensive In-Service Education Program for Staff Development.

To assist youth in acquiring a working knowledge of the spaceship earth philosophy, and the attitudes and skills essential in helping to resolve environmental problems, teaching education programs must be an integral part of an environmental education program.

The thrust of such a program should be toward a system aimed at helping teachers to acquire the concern, knowledge, and skills that will enable them to do the following:

a. Successfully explore relevant environmental issues with learners;

b. Encourage learners to express their feelings, perceptions, and ideas;

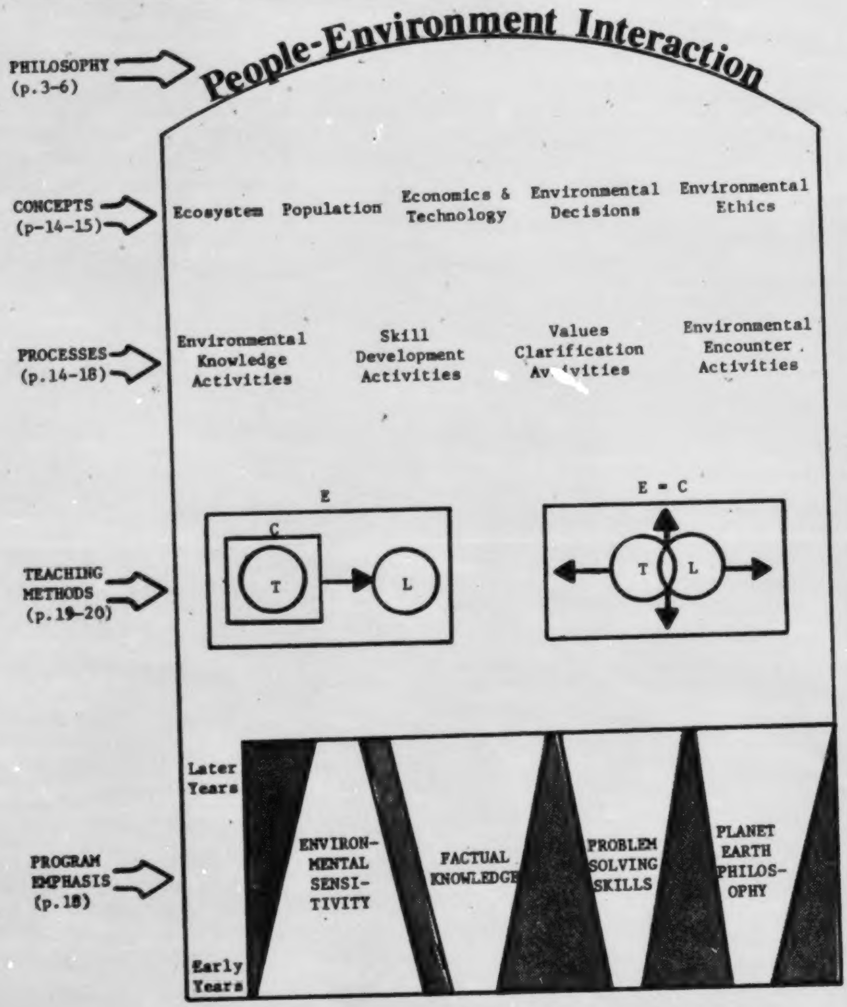

People-Environment Interaction
PHILOSOPHY (p.3-6)
CONCEPTS (p-14-15)
Ecosystem
Population
Economics & Technology
Environmental Decisions
Environmental Ethics
PROCESSES (p.14-18)
Environmental Knowledge Activities
Skill Development Activities
Values Clarification Activities
Environmental Encounter Activities
TEACHING METHODS (p.19-20)
E
C
T
L
E = C
T
L
PROGRAM EMPHASIS (p.18)
Later Years
Early Years
ENVIRONMENTAL SENSITIVITY
FACTUAL KNOWLEDGE
PROBLEM SOLVING SKILLS
PLANET EARTH PHILOSOPHY

FIGURE 6: ENVIRONMENTAL EDUCATION MODEL

c. Foster an atmosphere where information and ideas can be freely expressed and exchanged and the views of individuals and organizations heard and respected;

d. Encourage class members to analyze and clarify personal values;

e. Serve as a resource person in assisting learners in acquiring information;

f. Assist in the implementation of appropriate solutions devised by learners.

In handling in-service teacher education workshops, teachers should be involved not only in discussing various matters concerning environmental education, but involved in research and developing guidelines and instructional materials related to the program.

In developing an in-service teacher education program, the following should be considered:

a. Orientation sessions for all teachers and administrators as to the philosophy and structure of the environmental education program;

b. Involvement of the teachers at all grade levels and subject areas;

c. Discussion and development of written guidelines on:

  - Ways to integrate environmental education into the existing curriculum;
  - The role of the teacher and learner in selecting, planning, executing, and evaluating environmental education activities;
  - The school system's administrative policies and procedures that relate to environmental education;
  - Handling value analysis and clarification;
  - Handling controversial issues.

d. Development of written materials and instructional aids to assist teachers in understanding and presenting environmental information;

e. Design and offer training sessions on ways to handle topics such as: values, community problem-solving, and community sensitivity;

f. Developing a means of distributing to teachers, staff, administrators, and learners information relevant to environmental education;

g. Arrangement for education experiences to occur on school sites and in the neighborhood and community;

h. Development of a series of booklets containing information (environmental inventory) on the local community and produced in local workshops by teachers and students working as teams, and made available to learners, teachers, and administrators throughout the school system. The booklets might focus on topics such as government, housing, transportation, solid waste, water resources, air resources, waste water treatment, recreation, urban trees, yard care, public open space, etc. The following information should be included for each topic: basic information, problems and alternative solutions, field trips and tour opportunities, local resource people, instructional aids (film, filmstrips, slides, environmental games and simulations, environmental kits, overlays, etc.), and helpful information;

i. Providing the opportunity for teachers and learners to communicate to parents and the community regarding the philosophy and operation of the environmental education program; and

j. Promotion of local collegiate offerings and adult education programs for teachers interested in furthering their training in environmental education.

The first phase of the in-service teacher training program should be to include all teachers and administrators in the development of the philosophy, structure, and operation of the environmental education program.

The second phase should be to plan tours of the community to provide teachers and administrators with first-hand experience regarding their local environment and associated problems. Discussion should center on the local environment with an examination of relevant issues from an ecological, economic, political, social, and technological point of view. Emphasis should also be on ways to integrate community environmental studies into the school program. Information should be developed regarding the names of community citizens and governmental officials knowledgeable on the environment and available to serve the school as resource persons.

The third phase should be to offer a series of teacher-learner workshops to discuss and produce written guidelines and materials designed to assist teachers in implementing the goals and objectives of the environmental education program.

The fourth phase should be to offer a series of teacher-learner workshops on special topics, such as: community problem solving, values clarification, community sensitivity, and school site development and usage.

Phase 8: Develop a Reinforcing Environment.

It is imperative to keep in mind that to change an individual's beliefs, attitudes, values, and behavioral patterns, a very strong and reinforcing environment is normally required. For this reason, it is vital that the environmental education committee and coordinator work with all components of the community to identify ways that each component can assist the school system in achieving its stated environmental education objectives. It is also important that each component group make an assessment of its own program in an effort to strengthen its environmental education contribution to the entire community (such as sponsoring seminars, producing materials, providing tours, giving presentations, offering technical assistance, providing services, etc.). In this manner, as youth and adults circulate daily in their community, they will be touched by environmental concerns from many sources. This type of positive community reinforcement is vital in both forming and changing attitudes, values, and behaviors.

Some important component groups in most communities that have much to offer to the environmental education movement are: agencies, agriculture, businesses, churches, citizen organizations, elementary and secondary education, government, higher education, industry, labor, pre-school, and youth organizations.

Phase 9: Strategy to Overcome Program Constraints.

For an environmental education program to be fully implemented and successful, it is important that the environmental education committee and coordinator identify problems (constraints) that need to be overcome. Once this is done, the environmental education committee could use a "force field analysis" to help resolve each problem. This is a process by which one clearly states each problem and a goal to help overcome the problem. The next step in a "force field analysis" is to make an assessment of one's strengths (driving forces) and weaknesses (restraining forces) pertaining to the particular problem. Finally, identify possible actions and strategies to help achieve one's goal by using the driving forces to help overcome the restraining forces. Careful thought should be directed toward appropriate channels for implementing the proposed action (board of education, superintendent, curriculum committee, principal, school-community, student council, etc.). Refer to Figure 7 for a sample "force field analysis sheet."

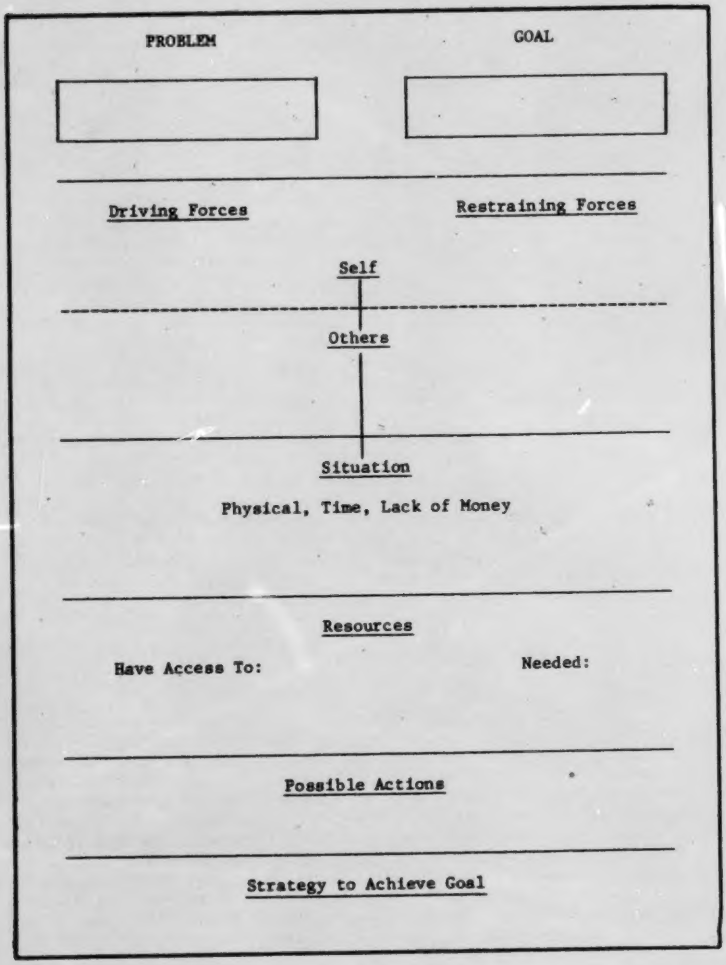

PROBLEM
GOAL
Driving Forces
Restraining Forces
Self
Others
Situation
Physical, Time, Lack of Money
Resources
Have Access To:
Needed:
Possible Actions
Strategy to Achieve Goal

FIGURE 7: FORCE FIELD ANALYSIS SHEET

Phase 10: Develop Instruments to Evaluate the Effectiveness of the Environmental Education Program.

It is imperative that environmental education programs be evaluated periodically to determine if the stated objectives of the program are being achieved. The results of the evaluation should be fed back so that the program can be modified to reflect information derived from the evaluative instruments.

Reliable evaluative instruments have been developed in the field of environmental education to measure learner and teacher changes in areas such as: community orientation; cognitive domain; affective domain; skill-behavior domain; environmental perception; values; exploratory behavior; self-concept; teacher-learner interaction; motivation; and concept understanding. Individuals or committees interested in evaluating environmental education programs should become familiar with evaluative instruments reported by the following: Bennett, 1972; Edward, 1950; Flanders, 1962; Larson, 1972; Oppenheim, 1966; Rentsch, 1973; Robinson, 1970; Roth, 1970; Stapp, et al., 1972; Swan, 1969; and Webb, 1970.

A very well designed instrument for evaluating a comprehensive environmental education program was developed by Dr. Dean Bennett (1972) for the Environmental Education Program, Yarmouth, Maine. This instrument could be modified to meet the needs of many environmental education programs.

The ERIC system (ERIC, School of Natural Resources, The Ohio State University, Columbus, Ohio) has produced a series of research guides providing sample research instruments in the cognitive, affective, and skill domains for evaluating instructional programs in environmental education. Individuals or school systems interested in considering instruments useful in evaluating environmental education programs should consider acquiring these booklets.

It is important that the evaluative instruments be as objective, reliable, and valid as humanly possible. It is vital that environmental education programs be evaluated and reported in the literature.

D. Summary

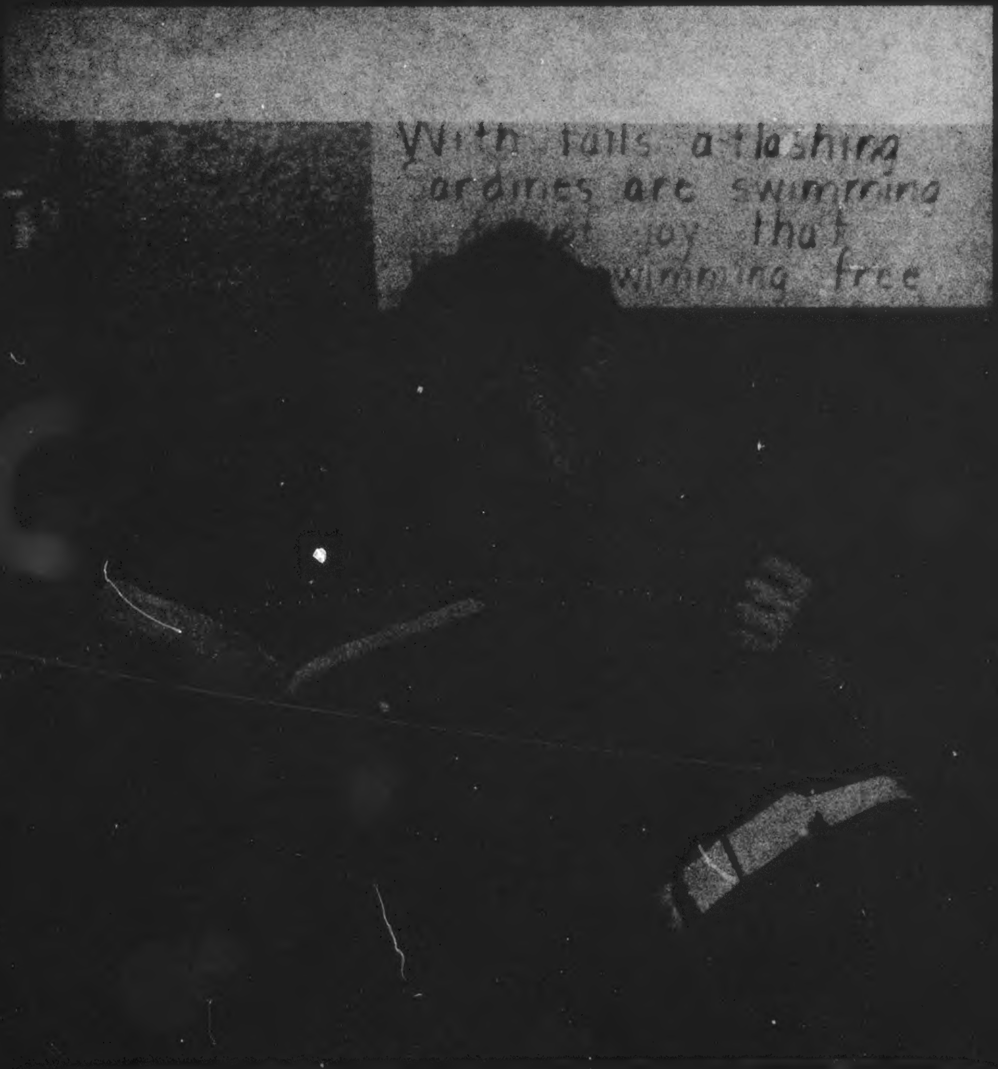
This section is intended to serve as a resource for school systems interested in developing a comprehensive and effective environmental education program. The ideas presented should assist schools in helping youth to become more knowledgeable concerning the total environment and associated problems, more aware and skilled in how to become involved in helping to solve these problems, and more highly motivated to work toward their solution.

This approach would assure that all learners would be exposed to an array of environmental issues and possible solutions. Integrated into existing subject areas, relevancy would be provided, and environmental education would be practically immune to the expulsion that frequently threatens new programs when funds are limited. Moreover, this approach fits into existing courses without restructuring of the curriculum.

To implement this instructional program into a school system (K-12), it is important that an environmental education committee be formed to provide the direction, leadership, teacher training, and supportive services essential to the program's success. To assist the teacher in implementing this instructional model, the role of the environmental education committee would be to help provide the supporting services (human, instructional, fiscal, etc.) essential to the success of the program. Some important supporting services include written guidelines (principles to follow while integrating environmental education into the instructional program, role of teacher and learner, ways to handle problem solving and values clarification, etc.), teacher training sessions (community problem solving, valuing, community sensitivity, etc.), and assistance to teachers so they more effectively overcome important constraints to the full implementation of the environmental education program.

The role of the classroom teacher is to expose the learner to the community environment in an effort to identify community environmental interests and concerns. Once learners have identified their interests and concerns, the role of the teacher is to assist class members in working through the processes of community problem solving and values clarification as they relate to the topics of high interest and concern of the youth. In this process, the learners should be developing attitudes (knowledge and feelings), values, skills, and behavioral patterns important in producing environmentally literate citizens.

Through the environmental education program advocated in this section, a twelfth grader should be more sensitive (total awareness) to her or his environment, better able to recognize environmental problems, more sophisticated in the use of problem-solving skills essential to the solution of emerging environmental problems, and more inclined to participate in dealing with environmental problems than the student who is exposed to conventional forms of instruction. Also, the learner would have an understanding and appreciation of the importance of relating ecological, economic, social, technological, and political information in solving present and future environmental problems.


With tails a-flashing
sardines are swimming
joy that
swimming free.

SECTION II

CONCEPT DEVELOPMENT ACTIVITIES

SECTION II

Concept Development Activities

The following Concept Development Activities were developed to assist teachers in assisting students to further their understanding of five major concepts basic to the development of an environmentally literate citizenry.

The five major environmental education concepts are: ecosystem, population, economics and technology, environmental decisions, and environmental ethics.

For each of the five concepts, specific understandings have been identified as appropriate for lower elementary, middle elementary, upper elementary, junior high, and senior high. Two activities have been developed for each understanding to assist students in furthering their understanding of each of the five concepts. The activities were also designed to enrich existing subject matter.

The concepts, understandings, and supportive activities that have been developed are listed on the following pages of this section. Each of the five concepts is immediately followed by its specific understandings and activities by grade level from lower elementary through high school.

CONCEPT

ECOSYSTEM

UNDERSTANDINGS:

A. Lower Elementary (Kdg., 1st and 2nd)

1. The earth can be thought of as a "spaceship", containing all of the air, water, and land we will ever have.
2. The sun is the basic source of energy for all life in every ecosystem.
3. Plants capture sunlight and use it to help them make the food and oxygen that people and other animals need in order to live.
4. Some animals eat other animals which in turn eat plants; some animals (like people) eat both plants and animals.

B. Middle Elementary (3rd and 4th)

1. An ecosystem consists of all the plants and animals in a given area interacting with each other and their non-living environment.
2. The interaction of plants, animals and their non-living environment form many cycles in an ecosystem (carbon or food cycles, mineral cycles, water cycles, etc.).
3. Some of the sun's energy has been stored in coal, peat, petroleum, natural gas, and other fossil fuels.

C. Upper Elementary (5th and 6th)

1. There are different forms of energy (i.e., light, heat, electricity, food, etc.).
2. Energy is neither created nor destroyed, but can be changed from one form into another.
3. With each transfer of energy (i.e., food chain) within an ecosystem, some energy is lost (mainly as heat energy).

4. Humans frequently, knowingly and unknowingly, waste energy.

D. Junior High (7th and 8th)

1. Anything added to the environment which accumulates in sufficient quantity to be unwanted by someone is pollution.
2. Too much pollution normally results in damaging the environment.
3. Natural cycles and systems have limited capacity to cycle or disperse pollutants.
4. Humans and natural resources are distributed unevenly around the earth.

E. Senior High (9th, 10th, 11th, and 12th)

1. An ecosystem is complex and is vulnerable to sudden or long-term disturbances.
2. Human beings are capable of strongly altering the cycles and systems of the earth.
3. More diverse communities tend to be more stable.
4. Fission and fusion are two relatively new sources of energy.

Lower Elementary

B. Diane Boyd

Building a Terrarium

1. Concept to be developed: Ecosystem

2. Understanding to be developed: The earth can be thought of as a "spaceship", containing all of the air, water, and land we will ever have.

3. Time: 1/2 day to set up the terrarium
   Several days for observation

4. Materials:

   a. A transparent container such as a mayonnaise jar
   b. Digging tools
   c. Plants
   d. Rocks, soil, and gravel
   e. Worms, insects, and "critters"

5. Procedure:

   a. Take a short trip outside and bring digging tools.

   b. Collect plants, rocks, gravel, soil, worms, and insects and return to the classroom.

   c. Look at collected material under a magnifying glass.

   d. Put soil in one container and gravel and rocks in another.

   e. Pour water in each container and see how the soil soaks up the water and the rocks do not.

   f. Look at the plants collected, pointing out the various parts.

   g. Discuss each rock asking what might hide under or sit on each one.

   h. Construct the terrarium, encouraging the class to build their own at home.

   i. Begin daily observations of the activity in the terrarium.

6. Discussion Questions:

   a. Why is the terrarium like a "mini" world?

   b. What do the plants need in order to survive?

   c. Where do plants get food for their growth? (sun and carbon dioxide from the air)

d. Could the plants survive without the air, water, and soil?

e. Where do animals get their food for growth and survival?

f. What else do animals need for survival? (Oxygen from the air, water, plants, etc.)

g. What do people need to survive?

h. What will happen if our air and water becomes more polluted?

7. References:

a. Environmental Learning Experiences for Kindergarten Through Second Grade. Center for the Development of Environmental Curriculum, Ohio Department of Education

Lower Elementary

Santina Buffone
Darlene Schoolmaster

Model of the Earth

1. Concept to be developed: Ecosystem

2. Understanding to be developed: The earth can be thought of as a "spaceship" containing all of the air, water, and land we will ever have.

3. Time: 3 days - day 1 - assemble system
   day 2 - observation
   day 3 - concluding discussion

4. Materials:
   a. Preferably, a sand or water table. If this is not available and/or feasible to use, a dishpan or two in a large box will suffice.
   b. Water and soil.
   c. Plastic drop cloth, large enough to cover the "spaceship" - tape
   d. School milk cartons (1 per child)
   e. Art materials, writing paper, pencils
   f. Oak tag and felt pens for making charts and labels.
   g. A globe, preferably a primary type.

5. Procedure:

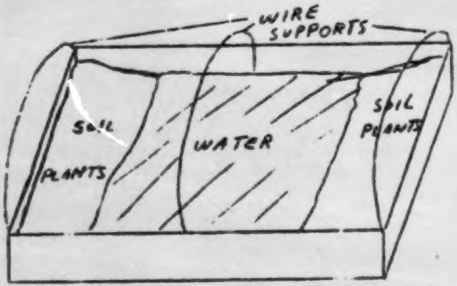
   a. Initial discussion and labeling of the total container as "The Earth." State that the globe is a model of the earth and that they, too, are going to build a model of the earth containing proportionate amounts of land and water.

   b. Lead children to observe that there is more water than land on the earth, and, if possible, the proportions of 2:1 should be observed or given.

   c. Using the milk cartons, count how many cartons of soil are being designated as "Land" in this earth model. The children can then pour the soil into the labeled container.

   d. Using the 2:1 ratio, fill twice as many milk cartons with water as were used for soil. This water is then added to the system and labeled as "Water."

   e. Using the plastic drop cloth, cover the system. Lead the children to see that there is air enclosed and that what is enclosed is the total of this earth's air, land, and water.



Plastic drop cloth taped securely around the table: propped up by supports.

f. After the model has been assembled, a story chart should be composed by the group and written by the teacher. The terms model, earth, land, water, and air and their meanings should be re-emphasized.

g. An opportunity for art expression of the activity should at least be available to the children.

h. The following day the concept that this is a closed system should be reviewed and reinforced with the children.

i. The children should be led to see that water can be seen on the plastic due to the process of evaporation and condensation.

j. An experience chart depicting this process might look like the following:

Sun

Condensation = Rain

Water - vapor - air

Evaporation

Water Land

6. Discussion Questions:

a. What is a model?

b. If a model is an exact replica but in smaller proportions, then what does the soil, water, and enclosed air represent?

c. What changes were observed, if any?

d. Did anything escape?

e. Was anything added?

f. If, then, this is an exact model of the earth, can we assume that the same changes can be observed on the real earth? (Observe a puddle evaporating; discuss cloud formation, observe rain.)

g.* Is there a limited amount of air (not space) around our real earth? Is there a limited amount of water? Of land?

*(Note: The pans are containers for soil and water: the plastic is simply the container for air. Do not allow the misconception that there is any kind of covering enclosing the atmosphere.)

7. References:

A. Glossary of terms:

1. Model--a small representation of a larger idea

2. Earth--the planet on which we exist, a closed ecosystem.

3. Ecosystem--An ecosystem consists of all of the plants and animals in a given area interacting with their non-living environment.

4. Closed "Ecosystem"--contains all the air, water, land we will ever have.

5. Soil--land
Water--seas, rivers, etc.,
Air--atmosphere

Lower Elementary B. Diane Boyd

What Do Plants Need To Grow?

1. Concept to be developed: Ecosystem

2. Understanding to be developed: The sun is the basic source of energy for all life in every ecosystem.

3. Time: One week if you buy plants
   Several weeks if you grow your own

4. Materials:

   a. Seeds
   b. Pots (with holes in the bottom)
   c. Soil
   d. Two plants

5. Procedure:

   a. Be sure one plant has enough sun, the right soil, and enough water daily.

   b. Keep the second plant in the closet and give it ample water.

   c. Check both plants in one week.

   d. After one week remove the plant in the closet and give it ample sun and water.

6. Discussion Questions:

   a. Why did the plant in the closet get "sick"?

   b. What is the effect caused by the sun's light?

   c. When it was returned to the sunlight, why did it get better?

   d. What causes the appearances of the plants to differ?

7. References:

   a. Spaceship Earth # 1. Metropolitan Detroit Girl Scouts, 153 E. Elizabeth, Detroit, Michigan, 48201

Lower Elementary

Santina Buffone
Darlene Schoolmaster

The Sun is the Source of Energy

1. Concept to be developed: Ecosystem

2. Understanding to be developed: The sun is the basic source of energy for all life in every system.

3. Time: 3 days - day 1 - cover system; minimum sun (over the weekend)
   day 2 - uncover system; maximum sun
   day 3 - observe and discuss

4. Materials:
   a. Ecosystem model from "Model of the Earth" (p. 16)
   b. Black plastic (or opaque garbage bag)
   c. Experience chart of evaporation-condensation cycle (p. 16)
   d. Access to the outdoors

5. Procedure:

   a. Tell the children that we need to discover what caused the condensation cycle to start. We will do this by making one change at a time.

   b. Refer to chart of cycle. Look at this chart and their model. Lead them to see that the sun is the only thing outside this system.

   c. How can we eliminate the sun from influencing our system? Move the model and cover it for the weekend.

   d. Observe the following Monday. Have the children decide if there is more or less condensation than occurred the day the system was built.

   e. Move the model again and uncover it in a position of maximum sun exposure.

   f. Observe condensation; relate and compare to previous days.

6. Discussion Questions:

   a. What makes water evaporate?

   b. Does the evaporation occur without the sun?

   c. What comes from the sun?

   d. Young children will probably say light and heat; tell them these are forms of energy. Thus, the sun provides this energy.

   e. Observe and discuss these processes occurring out of doors.

7. Glossary Additions:

   a. Evaporation — water changing from a liquid to a gaseous state.

   b. Condensation — water changing from a gas to a liquid state.

Lower Elementary

D. Schoolmaster
S. Buffone

Natural Cycles

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Plants capture sunlight and use it to help then make food and oxygen that people and other animals need in order to live.

3. Time: 1-4 weeks depending on materials selected.

4. Materials: Ecosystem established for Concepts 1 and 2. (Continued)
Seeds, e.i. lettuce or grass (one that will root and grow quickly)
Access to sunlight
Aphids

Ecosystem converted to Terrarium
Ecosystem established for 1 and 2
Plants, e.i. moss, ferns, violets from woods area or nursery.
Meal worms
Beetles, purchased or culture
Pond water

Set Up
Covered 2 gallon jar of distilled water
Vial of pond water or access to sun
Bio scope

Outdoor Plan
Access to outdoor area of birds, insects, plants, etc.
Board
Food for sun

5. Procedures:

a. Begin plant life growth in whichever system used.
b. Observe plant life out doors.
c. Lay a board across an area of grass.
d. View grass under the board several days later
e. Cover a portion of the plant life in the additional systems used so that these plants cannot make use of sunlight
For Pond Water: separate a portion of pond water in another container and remove to an area where plants will not have access to the sun.

f. View plants in the system you are using.

g. Introduce animals to eat plant life suggested for system used and/or observe this process outside. For pond water: use a bioscope to view microscopic animals eating algae.

5. Discussion questions:

a. What happened to the grass that was covered?
The pond water in darkness?
The plants that were covered?

b. Why were the plants that were uncovered able to continue growth?

c. What happened to the animals introduced to the closed systems?

d. Why were they able to live?

7. Reference:

Ten Minute Field Trips, Using the School Grounds for Environmental Studies, Helen Ross Russell, Doubleday (Dearborn Professional Library)

Availability of materials -- elementary school --ecosystem, covered jars, bioscope.

Wooded area or field--ferns, moss, violets, pond water.
Pet Store: meal worm culture, aphids, pond water.

A meal culture can be developed as follows in or out of the ecosystems.

air holes

meal worms from pet store
damp sponge

folded burlap

bran

Allow 3-4 weeks for beetles to develop. When beetles are developed, allow them out of the jar into the rest of the ecosystem to begin continuing development in terrarium for ongoing study.

Lower Elementary

B. Diane Boyd

Where Lunch Comes From

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Plants capture sunlight and use it to help them make the food and oxygen that people and other animals need in order to live.

3. Time: One hour

4. Materials:

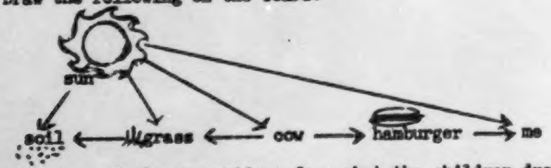
   a. Blackboard
   b. Paper
   c. Pencils and crayons

5. Procedure:

   a. Have the children draw food they eat for lunch.

   b. On the blackboard, write a lunch menu.

   c. Draw the following on the board:



   d. List some of the suggestions from what the children drew (For example: roast beef, chicken, pork chops, etc.).

   e. Point out how each food can be linked back to the soil, plants, and then to the sun's light.

6. Discussion Questions:

   a. Think of your favorite meat.

   b. What animal does it come from?

   c. What does that animal eat? (Almost always some form of plant)

   d. From where do plants obtain their basic needs?

   e. Why do we need the sun's energy in order to get a hamburger?

7. References:

   a. Environmental Learning Experiences for Kindergarten Through Second Grade. Center for the Development of Environmental Curriculum, Ohio Department of Education.

Lower Elementary

Shellie M. Ellison

Simple Food Chain

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Some animals eat other animals which in turn eat plants; some animals (like people) eat both plants and animals.

3. Time: 1 hour

4. Materials:

   a. Felt characters to illustrate the following song (sung to the tune of Six Little Ducks):

Chorus-{One little girl that I once knew,
Went to get the mail in the morning dew.

There by the box was a piece of corn,
Warming and growing in the sunny morn.

(Chorus)

There by the box was a little corn plant,
And chewing on its leaves were a worm and an ant.

(Chorus)

There by the box was the great big hen,
Pecking on that worm and far away from her pen.

(Chorus)

Dreaming of her dinner in a hungry way;
Corn on the cob and chicken souffle.

5. Procedure:

   a. Gather children around and tell them you are going to sing them a story about a little girl who lives on a farm, and what happens by her mailbox.

   b. Using felt characters, sing story to children.

   c. Talk about story with children.

   d. Repeat song, with children joining in.

e. Have children act out story, designating children to play the parts of a:

(1). Mailbox
(2). Girl
(3). Corn seed/plant
(4). Worm
(5). Ant
(6). Chicken
(7). Blades of grass
(8). Sun shining

6. Discussion Questions:

a. Which characters are plants?

b. Which characters are animals?

c. What did the chicken eat?

d. What did the worm eat?

e. What did the girl dream about eating?

f. Who ate plants?

g. Who ate animals?

h. Did anyone eat both?

i. How did the corn plant get there?

j. How do you think the seed got there?

k. What happened to the ant? (Try to get the children to say who would be the ant's predator.)

l. Do you eat plants?

m. Do you eat animals?

Lower Elementary

B. Diane Boyd

Interdependence

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Some animals eat other animals which in turn eat plants; some animals (like people) eat both plants and animals.

3. Time: Approximately 2 hours (with field trip)

4. Materials:

    a. Blackboard
    b. Pencils and paper

5. Procedure:

    a. List the following animals on the board. Write what they eat after asking the children if they know:

Animal	What They Eat
Cows	Plants (grasses)
Rabbits	Plants
Sparrows	Plants (seeds)
Worms	Digest decaying soil
Robins	Animals (worms and insects)
Cats	Animals
Wolves	Animals
Trout	Animals (other fish)
Turtles	Plants and animals (insects)
Humans	Plants and animals

    b. Go outside to a nearby pond, stream, or natural environment. Tell the children to watch what the animals are eating. Tell the children to watch the pond life, land life, and watch the life up in the trees.

    c. Have the children draw pictures of animals and what they eat, either using examples from the board or from what they observed.

6. Discussion Questions:

    a. Which of the living things in your pictures or on the board are able to make their own food (They are called "producers")? How do they do that?

    b. Which of the living things in your pictures or on the board cannot make their own food, but must eat other living things (They are called "consumers")?

c. Do any of the pictured or listed animals eat only plants (They are called "herbivores")? Which ones?

d. Do any of the pictured or listed animals eat only other animals (They are called "carnivores")? Which ones?

e. Which of the pictured or listed animals eat both plants and animals (They are called "omnivores")?

f. Can you think of any animals who might change their eating habits because they are around man?

Middle Elementary

Marilyn Masouredis

Pigeon Population Study

1. Concept to be developed: Ecosystem

2. Understanding to be developed: An ecosystem consists of all the plants and animals in a given area interacting with each other and their non-living environment.

3. Time: Flexible - (Suggest four weeks to compile data)
   day 1 - Present unit
   day 2 - Slides, film, and film strips
   day 3 - Art project
   day 4 - Write fictional stories and read orally
   final - Discussion

4. Materials:
   a. Pictures of pigeons
   b. Drawing paper, paint, crayons
   c. Film, filmstrips, slides
   d. Bulletin board
   e. Reports or fictional stories assembled in a book
   f. Project to raise money for feed (optional)
   g. Data table for bird observation

OBSERVATION TABLE

Number of Pigeons and Other Birds Seen at Our Feeder

	Mon.		Tues.		Wed.		Thurs.		Fri.	
	P*	O*	P	O	P	O	P	O	P	O
Week 1										
Week 2										
Week 3										
Week 4										

Pigeons				Other Birds			
Y*	R*	G*	B*	Y*	R*	G*	B*

TOTALS

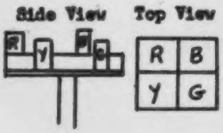
*P = Pigeon
*O = Other

Key 0 - One bird other than a pigeon seen at feeder
1 - One pigeon at feeder
*Yellow - Sunflower seeds
*Red - Bird seed
*Green - Bread
*Black - Food Scraps

   h. Bird feeder and feed — sunflower seeds, bird seed, bread, food scraps.

Simple Bird Feeder

Needs 4 sides (1 foot sq. mounted on pipe).
Have different feed in each of 4 sections.
Label sections according to above color code.



5. **Procedure:**

   a. Choose a location for the bird feeder that is visible from the classroom but not too busy. Set up a schedule for keeping the feeder full of seed. Use a variety of food--sunflower seeds, bread, bird seed, food scraps.

   b. Have a different child keep track of the number of pigeons that come to feed each day on the observation sheet. This gives every child in the class an opportunity to compile data over the month.

   c. Notice the kind of bird and the kind of feed the bird eats.

   d. Ask the children to bring in pictures of pigeons for a bulletin board. Select a committee to work on the bulletin board.

   e. Show films, filmstrips, and slides showing pigeons and their habitat.

   f. As an art project the children can draw and paint large pictures of pigeons in a still position and in flight. A city and pigeon scene can be created on a large wall either in the room or in the hall. Large block and rectangular shaped paper can be cut out and mounted on the wall to represent buildings and the cut out pigeons the children made can be distributed about the buildings by the children.

   g. The children can use a pigeon or pigeons in a fictional story with the bird as the main character. These stories can be read orally to the class and then assembled into a book.

6. **Discussion Questions:**

   a. Which birds appeared at the city feeder most frequently?

   b. Did the pigeons perch on the school's window sills and roof?

   c. Are the pigeons afraid of people?

   d. Do they eat what appears in the feeder?

   e. Do the other birds eat what appears in the feeder?

   f. Do the pigeons appear singly or in flocks?

   g. Do the same pigeons come back again and again to feed during the day?

Middle Elementary

Nancy Rhodes

Sand Dune Succession

1. Concept to be developed: Ecosystem

2. Understanding to be developed: An ecosystem consists of all the plants and animals in a given area interacting with each other and their non-living environment.

3. Time: 3 days - day 1 - introduction and movie
   day 2 - field trip
   day 3 - discussion

4. Materials:

   a. Sand dune area and access to the area.
   b. Movie (optional) - From Sand Dune to Forest
      Sand Dune Succession Story
   c. Ditto for each student showing diagram of dune succession stages.
   d. Pencil.
   e. White drawing paper.
   f. Ziploc plastic bags.
   g. Thermometer.

5. Procedure:

   a. Introduce dune succession process to children:

      (1). Drift area is important because after decay the material is blown over the sand. This material eventually builds up on sandy areas and provides the right environment for grass to grow.

      (2). More and more grass grows in the area and Cottonwood and Aspen trees find this a suitable environment.

      (3). The Cottonwoods provide a little shade. The environment is now cooler and pines find this a suitable environment.

      (4). Many pines soon take over. Oak trees sprout under the pines. A different environment is created under the pines. The needles from the trees have dropped and created a different type of soil.

      (5). The Oak trees are in competition with the pines for the sun light. The oak trees being broad leaf plants naturally get more sun. They thrive in this environment.

(6). The Oak trees multiply and grow. A canopy of oak leaves block out much sun from the forest floor. With less sun new oak seedlings find the environment less favorable. Maple and Beech trees find the environment suitable. The Maple and Beech thrive and the climax forest takes over.

(7). Fallen branches and trees are important for building up nutrients in the soil.

b. See the movie, "Sand Dune Succession Story - From Sand Dune to Forest".

c. Discuss movie, giving emphasis to the dependency of plants and animals on each other and also on their non-living environment.

d. Field trip to dune area.

e. Pass out ditto to each child. Groups of two or three children would work well together.

f. Take children to drift area first.

(1). Record information (sounds, smells, colors, soil type, plants and animals). Encourage children to really search through the drift area... get down on your hands and knees and REALLY look!

(2). Record the temperature in the drift area.

g. Move on to the middle beach area.

(1). Record information.

(2). Discuss why fewer insects find this environment suitable.

(3). Ask for single word descriptions of the middle beach. (Do this as an entire group).

(4). Record the temperature of the middle beach.

h. Move on to the grass area.

(1). Record information.

(2). Record the temperature of the grass area.

i. Move on to the Cottonwood-Aspen area.

(1). Have the children lay under a tree. Ask what kind of feeling they get in this area (would they get a different feeling in the middle beach area?).

    (2). Record information.

    (3). Record temperature of the Cottonwood-Aspen tree area.

j. Move on to the pine forest.

    (1). Do some quiet sitting. Close your eyes. Listen for sounds.

    (2). Have children lay down on their backs. Look up to the sun.

        (a). Would it be easier to see the sun in the middle beach area? the drift area? the Cottonwood-Aspen area?

        (b). Discuss if this would have any effect on the temperature.

    (3). Record the temperature in the pine forest.

    (4). Record your information.

k. Move on to the oak forest.

    (1). Discuss the colors around the area. What kind of feeling do the colors in this area give you?

    (2). Lay on your stomach on the ground. Look around you at this level. Pretend you are a chipmunk looking for acorns and imagine what it would be like to be so small.

        (a). If you were a chipmunk, would you like living in this area? Why or why not?

        (b). What games would you play if you were a chipmunk?

        (c). Where would you build your home if you were a chipmunk? Why or why not?

    (3). Record information.

    (4). Record temperature in the oak forest.

l. Find a decaying log and explore the fallen log community.

    (1). Remove some of the bark and discuss what is found.

    (2). Turn the log over. What life lives under the log?

[illegible]. Move on to the climax forest.

(1). Identify the kinds of trees.

(2). Pass out white drawing paper. Make natural rubbings. Try to help the children explore many kinds of materials. Berries are good for bright colors. Roots, stems, and leaves all have different color rubs. When pictures are done, display them on sticks stuck into the ground. You can have your own "woods gallery".

(3). Record information.

(4). Record temperature in the climax forest.

(5). Make plastic bag greenhouses. Each child gets a Zip-loc plastic bag. Fill it 1/3 full of forest soil. Take a clipping from a forest plant. Plant it in your bag. Zip the bag closed. Be sure and water your plant when you return to the classroom.

6. Discussion Questions:

a. Which area would you prefer to live in? Why?

b. Which area would you least like to live in? Why?

c. Why do certain animals live in certain areas?

d. What do you think would happen if someone decided to build some homes right in the middle of the climax forest?

e. What do you think happens to the trees and soil that wash into the lake from a blow-out or wash-out?

7. References:

a. Movie: From Sand Dune to Forest - A Sand Dune Succession Story.

Middle Elementary

B. Diane Boyd

Tracing Calcium

1. Concept to be developed: Ecosystem
2. Understanding to be developed: The interaction of plants, animals, and their non-living environment form many cycles in an ecosystem (carbon or food cycle, mineral cycles, water cycles, etc.).
3. Time: 1 - 2 hours
4. Materials:

   a. String
   b. Six pieces of cardboard (approximately 8½" x 11")
   c. Colored crayon, felt pen, etc. (optional)

5. Procedure:

   a. Connect string on all 6 pieces of cardboard so they can be worn around the neck.

   b. Write the following words individually, using one piece of cardboard for each word:

      (1). Tooth - (Calcium)
      (2). Soil
      (3). Plant
      (4). Cow
      (5). Milk
      (6). Child

   c. Tell the children that calcium is one kind of mineral. Like water, carbon or food, minerals go through cycles.

   d. Next, give the children a chance to role play. Give one child the neck sign bearing the word TOOTH. Explain that teeth are made of calcium. Being a baby tooth, he has just fallen out on to the SOIL.

   e. TOOTH will now join hands with SOIL, pointing out that there is calcium in the soil.

   f. Next, PLANT emerges from the SOIL. The child bearing the name PLANT joins hands with SOIL. We now realize that plants contain calcium.

   g. Cows eat plants. Indicate this to the class by having COW join hands with PLANT. Therefore, we can conclude that animals have calcium.

h. Cows produce milk. Indicate this by having COW join hands with MILK. Milk has calcium too.

i. Who drinks milk? Children do! Indicate this by having CHILD join hands with MILK. Humans have calcium in their bones.

j. As children grow up, their baby teeth fall out and decompose in the soil. CHILD now loses a tooth. Indicate this by having CHILD join hands with TOOTH to form a circle. This circle represents a cycle.

6. Discussion Questions:

   a. Ask volunteers to explain what a cycle is.

   b. How did the calcium get from the tooth and back to the child?

   c. What other cycles are present in nature?

   d. How can cycles be disturbed?

   e. Are cycles necessary? Why?

   f. Ask students and list where calcium can be found.

7. References:

   a. Self Earth Ethic, John W. Hart and Jessie M. Turner. Level Two. The Interstate Printers and Publishers, Inc., Danville, Illinois 61832.

Middle Elementary

Ruth A. Wendrow

Interaction in an Aquatic Environment

1. Concept to be developed: Ecosystem

2. Understanding to be developed: The interaction of plants, animals, and their non-living environment form many cycles in an ecosystem (carbon or food cycles, mineral cycles, etc.).

3. Time: 15 days - day 1 - trip to a pond, collecting materials
   day 2 - set up aquaria
   days 3 - 14 - observe, record, compile data, draw cycles, discussions
   day 15 - dismantle equipment

4. Materials: For each team of four students:

   a. 5 gallon aquarium (or suitable substitute, such as a pickle jar or fish bowl).
   b. Dip net and containers for collected materials.
   c. Pond water or dechlorinated tap water (aged water).
   d. Silica sand or fine gravel.
   e. Rocks about 3 inches in diameter, 3.
   f. Anacharis (Elodea - obtainable at most pet stores, in our pond) or other water plants, at least twelve 10 inch sprigs.
   g. Guppies, 2 mature females and 1 male.
   h. Water snails, 2.
   i. Daphnia (Water fleas), 50.
   j. Minnows, 5.
   k. Pane of window glass (or other suitable cover for aquaria).
   l. Distilled water (optional) or used aged tap water.
   m. Algae culture.
   n. Data or record sheets for each student:

Date	Name of Organisms	Description of Population	Water Condition

Note: The preceding materials list reflects quantities needed for establishing a 5 gallon aquarium. Quantities needed for containers of different volumes should be modified accordingly. For instance, a 1 gallon jar would require only five or six sprigs of Elodea and a 10 gallon aquarium would need about two dozen sprigs.

5. Procedure:

   a. Plan to set up aquarium at least a week in advance of its use.

b. Thoroughly wash out the aquarium. Do not use soap.

c. Spread a layer of sand or fine gravel about 1 inch deep over the bottom of the aquarium. Pile the three rocks in a corner of the aquarium.

d. Fill to within 5 inches of the top with water. If you use tap water, let the water stand in open containers for at least 24 hours before filling the aquarium. This allows chlorine or other gases to escape. Using pond water, allow same time to reach room temperature.

e. Take trip to the pond to collect Elodea, minnows, pond water.

f. Place the cut end of each Elodea sprig down into the gravel layer so that it does not float. Add algae culture to aquarium and more water until it is filled to within 1 inch of the top.

g. Let the aquarium stand in a well-lighted place for two days and then introduce the snails, daphnia, and fish.

h. If possible keep the aquaria near a well-lighted window. If this will subject the aquaria to extremes in temperature, you should place it in a more protected spot in the room. You will then also have to provide a light source of approximately 100 watts about 12 inches from the aquaria.

i. Cover the aquarium with the glass pane to reduce evaporation and to discourage students from adding items to the aquarium. Do not feed the fish or remove any materials from the aquarium in an effort to keep it clean! Add distilled or aged water periodically to maintain the water level. (Distilled water is recommended to prevent buildup of mineral concentration over prolonged period; however, local tap water, if low in mineral content may be used satisfactorily, or pond water, whose mineral content has been checked.)

j. Have students compile a list of the kinds of organisms in the aquarium. If they do not suggest it, remind them that some organisms are microscopic. Allow students to examine water samples under the microscope. As time passes, different organisms may "appear" (fungi, etc.) and should be added to the list. From class list use charts on ditto sheet to compile data on the date set up and every day of the project thereafter. The dates and descriptions of any changes that occur in the aquarium should be recorded.

k. Explain that nothing but water is to be added to the aquarium. Have students compile individual lists of all the interactions they think each kind of aquarium organism may be involved in. If the lists omit any organism it (and its interactions) should be added later. A composite list of organisms and interactions should be constructed and saved for later modification.

l. Ask students to predict the future of life in the aquarium. Mention that they can check the accuracy of their predictions by regular observation.

m. Make room charts, with the students, of the carbon cycle, food chain, and water cycle.

6. Discussion Questions:

a. How do algae and elodea fit into the CO_2 cycle?

b. What do plants need for photosynthesis?

c. What are the end products?

d. Why are these materials (end products) important?

e. What else is needed in this cycle? What can't this cycle do without?

f. Describe evaporation from the water surface. From plants.

g. How is condensation apparent in the aquarium?

h. What part does the animal life play in the water cycle?

i. When water evaporates, it becomes a _____?____. When it freezes it becomes a _____?_____.

j. If you heard one life scientist talking about the carbon cycle and another life scientist talking about the oxygen cycle, could these two scientists possibly be talking about the same thing? (Let students think about this, discuss it among themselves, review what they know.)

k. Is energy ever recycled in these natural processes?

l. Discuss: Since water is recycled, the amount of water on earth does not change.

m. Why did we have to add water to our aquarium?

n. Describe the ecological succession that would occur if we added nothing.

o. Water is vital to all organisms to dissolve the chemicals they need. Why must these chemicals be dissolved?

p. Chemicals in the soil become part of the plants. What happens to these chemicals when plants die?

q. Would man fit into the carbon cycle? The water cycle? Explain.

Middle Elementary Maryanna Baldwin

Water Heating Demonstration

1. Concept to be developed: Ecosystem.

2. Understanding to be developed: Some of the sun's energy has been stored in coal, peat, petroleum, natural gas, and other fossil fuels.

3. Time: 3 days - day 1 - set up demonstration, draw chart.
day 2 - begin heating water, record temperatures.
day 3 - discussion, show film.

4. Materials:
7 beakers to hold water
7 thermometers
1 hot plate
hibachi and charcoal
kerosene or alcohol lamp
1 large table or shelf space
window with access to sunlight
propane (or cigarette lighter)
butane gas
bunsen burner
asbestos sheets
chart for recording temperatures.

	#1	#2	#3	#4	#5	#6	#7
9:00							
10:00							
11:00							
12:00							
1:00							

Film---"Fuels: Their Nature and Use."

5. Procedure:

a. Set up materials for demonstration in the classroom, including the following:
7 beakers filled with water with a thermometer in each one:
#1--set in a spot in the classroom which has access to sunlight.
#2--set in a spot which has no sunlight, such as a closet.
#3--Electric hot plate.
#4--hibachi, with charcoal.
#5--kerosene lamp.
#6--propane.
#7--bunsen burner.

b. Make chart to record temperatures.

c. Choose a committee from the class whose responsibility will be to keep track of temperatures in each beaker, and record on chart hourly.

d. Show film: FUELS: THEIR NATURE AND USE. Show this after or during discussion questions.

6. Discussion Questions:

   a. How long did it take for the water to be heated in each of the beakers?

   b. What does the chart of recorded temperatures tell us about uses of energy?

   c. What is the origin of the fuels which were used to heat the water?

   d. Think about why these materials might be referred to as "fossil fuels."

   e. Can you draw a conclusion about what our main source of energy is?

Middle Elementary

Montel Ruble
Marion Maitland

The Sun's Stored Energy

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Some of the sun's energy has been stored in coal, peat, petroleum, natural gas, and other fossil fuels.

3. Time: One day

4. Materials:

   a. Geological time line chart

5. Procedure:

   a. Display time line chart.

   b. Introduce time line so students will understand geological processes of the earth.

   c. Organize children into 4 groups for creative dramatics.

      (1). One group will represent plants and animals of the Pennsylvanian period of the Paleozoic Era.

      (2). One group will represent the different environmental conditions of the Pennsylvanian period.

      (3). One group will represent the Cenozoic Era.

      (4). One group will represent the fossil fuels of the present time.

      (5). One person will be the sun.

   d. Give the students an opportunity to meet in their specific groups to work up their part in the creative dramatics skit.

   e. Each group will act out their part of the skit.

6. Discussion Questions:

   a. Discuss the different environmental conditions of the earth which took place during the Pennsylvanian period.

      (1). What made the plants and animals change?

      (2). Bring out the changes made by ice, water, eruptions and upheavals of the earth's crust.

b. Has the sun ever changed during all these years?

c. Where has the sun's energy been stored?

d. Why is the sun so important to life?

e. Name the fossil fuels.

f. How does man use the fossil fuels?

g. Will man ever run out of fossil fuels? Why?

7. References:

a. Geology and Man. Kenneth and Hussey Russell, Prentice-Hall Inc., New York. 1948.

Upper Elementary

Joannie Robb
Neal Moore

The Different Forms of Energy

1. Concept to be developed: Ecosystems

2. Understanding to be developed: There are different forms of energy (i.e., light, heat, electricity, food, etc.).

3. Time: 5 days - day 1 - Investigate the meaning of energy.
   day 2 - Discover the major forms of energy.
   day 3 - Discussion.
   day 4 - Field trip to plant that makes electricity.
   day 5 - Discussion.

4. Materials:

   a. Pencil and paper.
   b. Films: "Energy and Its Forms", "Food, Energy, and You", and "Machines Do Work".
   c. Data table; one for each student:

Baker's Dozen Choices	Energy I See	Ways I Use Energy

5. Procedure:

Day 1:

a. Do the valuing activity called "Baker's Dozen".

b. Show the film called "Energy and Its Forms".

c. Students go to the library and find as many definitions of "energy" as possible.

d. Discuss the definition of energy and ask students to give examples of energy according to the definitions found and from the film.

Day 2:

e. Show short films: "Food, Energy, and You" and "Machines At Work". After each film emphasize the form of energy illustrated.

Day 3:

f. Discuss the forms seen on the films the previous day and how those forms compare to the definitions found in the library.

g. Ask students to find a relationship between all the forms shown the previous day and if there is a possible sequence to the forms found on their Baker's Dozen list.

Day 4:

h. Field trip to a plant that produces electricity (such as Detroit Edison).

i. Have students fill in record column on Data Table during field trip.

j. For homework, have students fill in third column on Data Table.

Day 5:

k. Discuss the students findings from the third day with their results on the data tables.

l. Encourage students to find a natural progression sequence in converting one form of energy to another, beginning with solar energy and ending with nuclear energy.

6. Discussion Questions:

a. Why did you make the choices you made in "Baker's Dozen"? What would life be like without your top three choices?

b. What does electricity do and where does it come from?

c. What were some of the energy forms described in the film? Where do they come from? How do they compare to electricity?

d. What energy forms were represented in the films? Where these forms come from? What do they end up as? How are they related?

e. How is a person a source of energy? Where do people get their energy? How is energy in a person utilized? How is energy in people dependent on other forms of energy?

f. Is there a relationship or sequence to the energy forms?

g. What forms of energy were added to your list after visiting the power plant?

h. What additional sources and uses did you find at home?

i. What are ways of converting one form of energy into other forms?

j. What alternatives are there for the different ways you can use this material?

Upper Elementary
Mary Lou Hess

Forms Of Energy

1. Concept to be developed: Ecosystem

2. Understanding to be developed: There are different forms of energy (i.e. light, heat, electricity, food, etc.)

3. Time: 4 days - day 1 - Present ideas of energy and set up research groups
   day 2 - Group research and experiments
   day 3 - Sharing of research and demonstration
   day 4 - Discussion

4. Materials:

   Elementary science experiment resources such as science texts and school library science experiment books, describing uses of air, heat, electricity, water, etc.

   Other materials suggested by these books for construction of a pinwheel, water-wheel, battery-powered light or bell, simple steam engine, etc. such as:

   metal can with screw top
   glass tubing
   thin wood (berry boxes)
   small dowels (or Tinker Toys)
   candles
   hot plate
   lightweight cardboard
   construction paper
   drinking straws
   rubber corks with holes for tubing
   flashlight batteries
   flashlight bulbs
   copper wire
   scrap wood
   nails
   electric bell

5. Procedure:

   a. Ask students what energy is and draw out idea of "ability to do work". Discuss kinds of energy and uses of energy that they can think of. Think how kinds of energy might be demonstrated.

   b. Divide class into groups of 3 or 4 to research information about kinds of energy and then to choose one kind they will demonstrate to the class.

   c. Let each group plan and present a demonstration and give some information on its chosen kind of energy.

6. Discussion Questions:

   a. Energy which is stored up is called potential energy. Give examples from the group demonstrations of potential energy.

   b. Kinetic energy is energy in use or in motion. Where did you observe this energy?

   c. Scientists tell us that all energy comes from the sun originally. Trace each kind of energy demonstrated back to its dependence on the sun. (i.e.e stored energy in fuels formed from vegetation long ago, the hydrologic cycle that constantly replenishes the water power supply, etc.)

   d. Are there other kinds of energy that were not demonstrated? Name those you know about. Do these trace their origin to the sun, also? Are there new kinds of energy scientists are discovering and working on?

   e. What resources do we use in our homes and businesses to supply most of the energy? Is there a need to be concerned about the supply of these resources? Why?

   f. What ideas can you give for helping to conserve energy - giving resources?

7. References:

Science is Discovery #5
Basic Science Program - Scott Foresman

Concepts in Science
Harcourt, Brace & World

Science Teaching Today
National Science Tea. Assoc. (Air, Heat, Water)

It's Our Future
Ecological Science Series - Globe Book Co.

Upper Elementary

Mary Lou Hess

Energy Changes

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Energy is neither created nor destroyed, but can be changed from one form into another.

3. Time: 4 days - Days 1-2 - Explorations and demonstrations
Day 3 - Film
Day 4 - Discussion

4. Materials:

a. For each group of 4 students:
(4) D cell batteries
(4) Flashlight bulbs
(2) buzzers or bells
(20) wire sections 1' lengths
(4) bulb sockets
(1) wire stripper
(2) screwdrivers
masking tape

b. Bunsen burner or hot plate
Erlenmeyer flask 400 ml.
(1) hole rubber stopper for flask
90° bend glass tubing
250 ml. beaker
(2) ring stands
test tube
centigrade thermometer
sodium hydroxide crystals
meter wheel (light weight)
9" length of 1½" diameter glass tubing

c. Ammonium dichromate
Magnesium ribbon fuse
Ovenware dish or
crucible
Tray to catch ash

d. Heat-Mechanical
Light bulb
Tin can lid
Tin snips
Fine wire

5. Procedure:

a. (1). Divide class into groups of 4 working in pairs. Let each group set up circuits of various complexities, perhaps pooling resources. Encourage students to try different ways of making the lights come on or the bell ring.

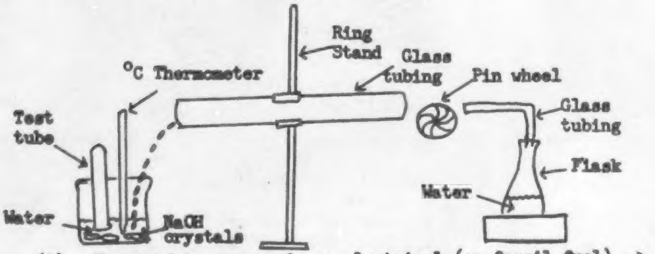
(2). Suggest "Can you make the light go on and the bell ring in the same circuit?"

(3). Notice that in some circuits lights are brighter than in others, perhaps the bell will ring but the remaining energy will not be enough to light the bulb (though it may glow in the dark). With several cells in series, lights may blow out.

(4). Although total amount of energy in system remains constant, its form is changed from electrical to mechanical or electrical to heat and light. Eventually energy will have been dissipated in heat and will seem to have been lost, but actually still exists in the atmosphere.

b. (1). Set up demonstration as shown in the diagram. Use caution in handling of the hydroxide.

(2). Set system in motion as water comes to boil with heat energy at 212° F. It forms steam which is directed onto the pin wheel where it causes it to revolve. Water running off the water wheel is directed into the tubing and into the beaker where it combines with the sodium hydroxide in a chemical energy release that heats the water in the test tube.



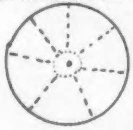
(3). Forms of energy used are electrical (or fossil fuel) → heat energy → chemical energy → heat.

(4). Is some energy "lost" or dissipated in the system? At what points do you believe some is lost and in what form?

c. (1). Place a crucible or small dish on a tray. In the crucible place two tablespoonsful of ammonium dichromate. Place a 2-inch length of magnesium ribbon in chemical and light it.

(2). The resulting display of a "volcanic" eruption will provide a very dramatic display of chemical energy heat and light.

d. (1). Find the center of the can lid and dent it in with a nail. Draw a 1" circle around the center. With the tin snips cut into the circle edge at regular intervals around the edge as:



(2). Bend one edge of each vane blade slightly to one side.

(3). With the wire, form a circle that will fit over the light bulb so that one free end extends to the center of the bulb and projects upward.

(4). Balance the spinner center dent on the projecting wire "pin". When the light is lighted the heat energy from the bulb will warm the air and cause the vane to spin. (If it is not balanced some careful trimming of blades of the vane will help).

e. Show film: Energy and Work (11 min.) Encyclopaedia Britannica

6. Discussion Questions:

a. What forms of energy have you seen at work? What is the source of all these forms? (the sun)

b. What changes in forms of energy can you see in your classroom? In your school? In your home?

c. Tell how energy forms change in the operation of a sound movie projector; in a power lawnmower; in a pencil sharpener.

7. Reference:

a. Teaching Elementary Science Through Investigation and Colloquium, Meadows, et al., Harcourt, Brace, Jovanovich.

Upper Elementary

Jeannine Bosma

Food Chain and Food Web

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Energy is neither created nor destroyed, but is changed from one form to another.

3. Time: 3 days - day 1 - Introduce concepts and vocabulary of chain.
   day 2 - Introduce concepts of food web.
   day 3 - Field trips.

4. Materials:

   a. Colored paper.
   b. Scissors.
   c. Glue.
   d. String.
   e. Cardboard boxer.
   f. Note cards.
   g. Pencils.
   h. Paper.
   i. Clipboards.

5. Procedure:

   a. Have children pick a recent meal they have eaten (or their favorite food) and using the food chain chart, trace together one or two of the meals back to the green plant. Then have several students trace their own.

   b. From the above activity, introduce the names of the different categories of animals and plants and discuss how energy derived from the sun is transferred to each.

   c. Label the boxes according to categories and put a name of an animal or plant on each note card. Create a game situation by having the students take turns drawing a card and placing it in the correct box.

   d. Expand the concept of a food chain by introducing the food web. Trace the food chain backward from man, students should quickly see that the links can expand in many directions - the more animals involved, the more complicated the chain becomes, hence the name food web.

   e. To dramatize this concept: On a piece of paper that can be "pinned on", have students draw different links in various food chains. Each child then takes one part of the link in the chain. Strands of string connect links. These chains will often interlock to form a web effect.

f. Field Trips:

(1). Take students to a wood lot or some wooded area relatively close by the school. Each student will note as many plants and animals (according to catagories) as he sees while on a 15 to 30 minute observing trip.

(2). If possible, immediately following, take the class to a very different environment (empty lot, lake shore, etc.) and have them categorize the plants and animals there.

g. Using the two above data sheets, have the students compare and contrast their findings and finally draw up the different food chains and webs they found.

6. Discussion Questions:

a. How does a plant capture and store the sun's energy? What happens at night or during the winter to this energy?

b. Why are decomposers such small organisms? What does this tell us about the energy level here?

c. How does the way we dispose of our solid wastes differ from the natural food chain?

d. How have we, as humans, broken down the natural food chain and how have we eliminated some links entirely?

e. Using what you have learned about the natural food chain, what might you do if rabbits became a problem in your community?

f. Can you explain this statement using the food chain? "The amount of beef produced in a season depends on the number of cats in the neighborhood of the clover fields."

g. At which end of the chain is the greatest amount of energy? The least?

7. References:

a. Adventures in Environment, National Env. Educ. Development, Silver Burdett Co., 1971

b. Teacher's Curriculum Guide to Conservation Education (4,5,6), J. G. Ferguson Pub. Co., 1968, 69.

c. A Place To Live (Teacher's Manual), National Audubon Society, 1970.

8. Audio-visual sources:

   a. How Plants Help Us, b/w, 12 min., McGraw-Hill (film).

   b. Food Chain chart is available through the National Audubon Society.

9. Independent Activities:

   a. Mobiles or paper chains of food chains can be made.

   b. Make a diorama depicting the food chain of your choice, showing that all animal life ultimately depends on green plants (and sun).

10. Vocabulary to be developed:

    Photosynthesis
    Phototropism
    Food Chain
    Tropic level
    Food Web
    Energy transfer
    Herbivore
    Omnivore
    Carnivore
    Decomposer

Upper Elementary

Mary Lou Hess

How Much Energy Do You Use?

1. Concept to be developed: Ecosystem

2. Understanding to be developed: With each transfer of energy (i.e. food chain) within an ecosystem some energy is "lost" (mainly as heat energy.)

3. Time: 3 days - day 1 - Experiment with inclined plane
   day 2 - Plan and assign "How much energy do you use?"
   day 3 - Discussion

4. Materials:

Experiment #1
board approx. 24" x 4"
cigar box
sand
screw eye
spring balance
ruler
petroleum jelly
sand paper (large piece)
3 dowels of same diameter - 10" wide

Experiment #2
Energy Expenditure table for each child:

Energy Used by 100# person in Calories per hour

Sewing	10-30	Running	530-670
Writing	15	Bicycling 5 mph	190
Sitting at rest	10	10 mph	300
Standing relaxed	15	14 mph	470
Dressing and Undressing	20-30	Horseback riding	
Ironing	40	walking	100
Dishwashing	40	trotting	340
Sweeping or dusting	50-85	galloping	400
Polishing	100-150	Dancing	150-270
Housepainting	100-150	Gymnastics	150-340
Carpentering	100-150	Playing tennis	270-340
Sawing wood	270-400	Playing Soccer	350
Walking 2 mph	130	Wrestling	600-700
3 mph	160	Sleeping	10-100
4 mph	230		

Calorie Chart (or inexpensive purchased one)

Meats	Calories
Bacon - slices	95
Beef Roast	210
Hamburger 4 oz.	250
Bologna 1 slice	85
Chicken 3 oz.	180
Frankfurter	155
Ham 3 oz.	290
Lamb lean only 2.5 oz.	140
Pork roast 2.5 oz.	175
Sausage 4 oz.	340
Fish 3 oz.	140
Vegetables (1 cup)	
Baked Beans	320
Beets	70
Broccoli, cabbage carrots, green beans	40
Squash, tomatoes	40
Corn	170
Lima Beans	150
Lettuce - 2 large leaves	5
Potatoes (mashed)	150
Desserts	
Cake 1 slice	180
Chocolate layer	420
Candy - chocolate 1 oz.	145
Doughnuts, plain each	135
Ice Cream 1/2 cup	200
Pie 1 slice	300

Fruits	Calories
Apple-med.	70
sauce	185
Bananas	85
Cantaloupe 1/2	40
Fruit cocktail 1 cup	195
Orange	65
juice (1 cup)	110
Dairy	
Butter 1 square	50
Cheese 1 oz.	100
Cottage Cheese 1 oz.	30
Eggs - each	90
Milk (1 cup)	165
Salad dressings (1 tablespoon)	110
Breads	
Bread 1 slice	60
Cereals 1 cup	105
Macaroni-spaghetti - 1 cup	155
Pancakes 4" each	55
Rice, noodles - 1 cup	200
Miscellaneous	
Carbonated beverages 8 oz.	100
Cocoa	235
Peanuts 1/2 cup	420
Peanut butter 1 tablespoon	90
Pizza 6" wedge	200

5. Procedure:

a. Set up board as an inclined plane with one end resting on a pile of books about 6" or more above table level. Fill cigar box with sand until it weighs one pound.

b. Fasten screw eye to front of box and attach string. Pull the box up the inclined plane by the spring balance, reading the "pull" required after it has started moving. Measure the distance along the board that will lift the base 4" from the table.

c. Potential energy in a raised object is equal to the distance it was lifted x its weight. Energy needed to raise it is equal to distance it was moved x force used to move it. If no energy is "lost", the two products should be the same. 1/3 ft. (4 in.) x 1 lb. = 1/3 foot pound of potential energy. Why is there a difference? Some energy is aways "lost" in every transfer of energy - usually as heat. Was this true in your experiment?

d. Ask what ideas students have to modify the experiment for different results. Some ideas might be: sandpaper fastened to the inclined plane, petroleum jelly applied to the board, or dowels placed under the box. Try suggestions and compare results with first ones.

e. Plan "How much energy do you use?" Each child will keep two records for one full day totaling 24 hours. (One record will use the Energy Expenditures chart to record everything the student does and the length of time he does it. The other will chart the amount and kind of foods eaten during the day with the energy value of each item.

6. Discussion Questions:

a. How did your energy input compare with your energy output?

b. What ideas do you have for any differences between them?

c. Can you think of any further experiment you can carry out to test your ideas?

d. If you are consuming more Calories than you are using, what does your body do with that potential energy?

7. References:

Science 5 Mallinson & Brown
Science Program Silver Burdett

BFA Ecology Activity Cards
BFA Educational Media

Additional Reading:
Diet for a Small Planet Lappe
Ballantine Books

Upper Elementary

Karen Kline
Karen Lilicy

Energy Transfer and Loss

1. Concept to be developed: Ecosystem

2. Understanding to be developed: With each transfer of energy (i.e., food chain) within an ecosystem, some energy is lost (mainly as heat energy).

3. Time: 1 hour

4. Materials:

    a. 1 package yeast
    b. 1 test tube and a cork stopper
    c. Warm water
    d. Sugar
    e. Vaseline

5. Procedure:

    a. Crumble the package of yeast between your fingers into the test tube.

    b. Add enough warm water to fill the test tube 3/4 full.

    c. Add 1/4 teaspoon sugar to the test tube.

    d. Smear Vaseline on the cork and stopper the test tube firmly but not tightly.

    e. Observe the following reaction: As the yeast cells use the sugar, it produces a gas. Soon you should notice bubbles of gas forming. As the gas is produced, it presses against the sides of the tube and the cork. As the pressure gets higher, the cork should pop off.

6. Discussion Questions:

    a. What has happened to the cork? Why?

    b. Why did we place Vaseline on the cork? Did it serve its purpose?

    c. Was any "work" performed by the cork? Where did the energy come from?

    d. What helped the yeast cells obtain their energy?

e. What kinds of things do you do that burn up energy?

f. Is your body working while going through the digestive process? Is this using energy?

g. How do you supply your body with the energy it needs?

h. Can you think of another example showing a loss of energy during a transfer of energy?

i. Why is it nice to have a brother or sister to snuggle up next to in bed on a cold night?

j. Where is energy lost in a food chain as opposed to the energy being transferred?

k. Give another example of a food chain showing transfer and loss of energy.

l. Name some exmnples of energy transfer and loss in:

    (1). A water ecosystem.
    (2). A meadow ecosystem.
    (3). A mountainous ecosystem.
    (4). A desert ecosystem.
    (5). An artic ecosystem.

m. How will this energy loss affect an ecosystem?

7. References:

a. Brandwein, Paul F.; Beck, Alfred D.; Strahler, Violet; Hollingworth, Leland G.; Brennan, Matthew J., The World of Living Things. Harcourt, Brace, and World, Inc., 1964.

Upper Elementary

Mary Lou Hess

Energy Investigation

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Humans frequently, knowingly and unknowingly, waste energy.

3. Time: 3 days - day 1 Introduction of subject and explanation of project and materials
   day 2 Compile data and write suggestions
   day 3 Discussion

4. Materials:

   a. pencil
   b. paper
   c. copy of chart for each child

How Many	Energy-using Machine or Appliance	Kind of energy	Ave. Time used daily	Check One	
				Necessary	Helpful

5. Procedure:

   a. Discuss with your class the sources of energy we use generally in our homes, schools and businesses, including internal combustion engines.

   b. Give each student a chart to take home and gather data on use of energy. If appliance is not used every day the weekly time it is used might be divided by 7 to give an approximate daily use time.

c. Things like an electric stove used for cooking would be checked "Necessary", as would electric lights. "Helpful" would indicate "work-savers" whose jobs could be done with manpower, such as a mixer or garbage disposer.

d. "Kind of energy" refers to source such as electrical, natural gas, etc.

e. After gathering the data each student should write 4 or 5 suggestions for conserving energy at his house.

f. When the class discusses the data they may want to compile a list of suggestions to be taken or sent home with the class or perhaps the whole school.

6. Discussion Questions:

a. What source of energy is most used in your homes? What fuels are used in generating electricity?

b. Some experts think we will need double the amount of electricity by 1980. What will that mean in terms of our fossil f fuels?

c. What are some ways we can conserve energy so less will be wasted?

d. Does careless use of materials such as paper have any relation to use of energy?

e. How has the concern about air and water pollution affected the production of electricity?

f. What new sources for electricity are being used or considered? Do they have any harmful effects on the environment?

g. How might your school engineer help in compiling your energy-conserving suggestions?

7. References:

Environmental Education in the Elementary School,
Sale and Lee, Holt Rinehart & Winston

It's Our Future - Knight and Moore Globe Book Co.

Ecology Activity Cards - BFA Educational Media
Ecology Series I

Upper Elementary B. Diane Boyd

You and Energy

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Humans frequently, knowingly and unknowingly, waste energy.

3. Time: Approximately 1½ hours

4. Materials:

   a. Pencils
   b. Paper

5. Procedure:

   a. Discuss different forms of energy found in our environment (electricity, heat, light, food, etc.) and give common examples of each.

   b. Instruct the children to answer the following questions:

      (1). Your father is driving you to the movies and is traveling 10 miles an hour over the speed limit. Would you say anything?
      I would ____________________
      because ____________________.

      (2). You and a friend go into a nearby store to buy some pop. The store sells only disposable cans. Your friend knows of a store two blocks away that sells returnable bottles and asks if you want to walk to the other store. What would you do?
      I would ____________________
      because ____________________.

      (3). You're watching your favorite television program and discover that you're very chilly. You know if you go to your room to find a sweater that you might miss the good part. The thermostat is right next to where you are sitting and would only take a second to turn it up. Which would you do?
      I would ____________________
      because ____________________.

      (4). You just climbed into bed and You're very tired. Just as you close your eyes you remember that you left the porch light on. What would you do?
      I would ____________________
      because ____________________.

(5). You have decided to go to a friend's house who lives nearby. You're half way to your friend's home when you realise that you left the television on. No one else is home to turn it off. What would you do?
I would ______________________________
because ______________________________.

(6). You are with a friend who, in a similar situation, leaves his television on. Would you say or do anything?
I would ______________________________
because ______________________________.

(7). Your father decides to buy a new car. He wants to know your opinion. One car is a luxury car that uses a lot of gasoline. The other car he's considering is not as luxurious and uses less gas. What would you say?
I would ______________________________
because ______________________________.

c. Tell the children to take the papers home to discuss with friends or their family.

6. Discussion Questions:

a. Take each question individually and discuss the responses in class.

b. Ask the students for examples that they know of where humans waste energy.

c. Discuss ways of correcting wasteful behavior.

d. Discuss why humans are knowingly and unknowingly wasteful.

Junior High

Ann P. Sibole

Is Your School a Closed System?

1. Concept to be developed: Ecosystem

2. Understandings to be developed: Anything added to the environment which accumulates in sufficient quantity to be unwanted by someone is pollution.

3. Time: 2 class periods

4. Materials: Question sheet containing the following questions:

   a. Does the school have pop machines? Are they returnable bottles?

   b. What happens to the garbage from the cafeteria after lunch?
   What could be done with the paper?
   What could be done with the wasted food?

   c. Does your school use washable plates, silverware and glasses?
   If not, what does it use?
   Do you see anything wrong with that?

   d. Is school trash burned on the site? If not what happens to it?

   e. How many teachers run dittos on both sides? Question 10 and figure the percentage.

   f. How many teachers use scrap paper for short quizzes or other activities in the classroom? If they do not, ask their reasons. Ask 10 and figure the percentage who do.

   g. Do any teachers have a box for scrap papers to be tossed and taken to a recycling center.

   h. Does the office use recycled paper? If not, ask them for their reasons.

   i. Some schools use scrap paper to make scratch pads. Does your school?

   j. The school furnace uses oxygen when it burns fuel to heat the school building. Plants tend to replace some oxygen that man's activities use up. Does your school have any trees on the site? How many of what kinds? Where would you like to see more trees planted? For what reasons?

   k.. Grass and other green plants will do much the same thing that trees do with oxygen. Does the school site have lawns and shrubs?

   l. Is it realistic to try to make a school a closed system?
   Why or why not?

m. Name some things that schools use which are not kept on the school site and most likely could not be recycled.

n. Mention some things which have to be brought into the school which the school cannot provide for itself.

o. Is it possible for an entire nation to be a totally closed system? Name some things which it cannot keep within its boundaries - things which are shared by all nations whether men would like it that way or not.

p. Name some things which the United States must get from outside her borders.

q. What is the only physical unit (area) which can be called an actual closed system?

5. Procedure:

a. Introduce the idea of a closed system by discussing how a school could partially operate on a closed system approach.

b. Hand out question sheets and allow students to work outside the classroom in pairs, answering as many questions as they can in the time allowed (30-35 minutes). Encourage them to ask people lots of questions.

c. Report back on their findings the following day in a discussion session.

6. Discussion Questions:

a. Are there ways you see that the school operates as a closed system? Name these.

b. List ways it could operate more like a closed system.

c. Choose one of these and list the steps you or some one else might take to try to make the change occur.

d. What did you learn about the school or the people in the school that you did not know?

e. Did people cooperate? Did they refuse to give the information you were seeking?

Junior High

Don Courtright

Where Does It Go

1. Concept to be developed: Ecosystem.

2. Understanding to be developed: Anything added to the environment which accumulates in sufficient quantity to be unwanted by someone is pollution.

3. Time: 2-3 days — day 1. Clean up.
day 2. Compilation of data and preparation of bulletin board chart.
day 3 Optional film: Clean Town U.S.A.

4. Materials: Litter collection bags, meat paper or poster board, paints, colored pens, pencils,
Film: Clean Town U.S.A.

(Suggested Chart)

POLLUTANTS

Type of Material	Quantity
1. Bottles	1. About 400
2. Cans	2. About 350
3. Smoke	3. Four sightings
4. Plastic	4. About 25#.

5. Procedure:
   a. Clean up around school in a given area.
   b. Bring refuse to a central area to be picked up by a sanitation crew.
   c. Dump trash and estimate amount of each type of waste.
   d. Observe on clean up other types of waste that cannot be picked up.
   e. Return to school with data.
   f. Make a chart of types and amounts of waste picked up and observed on clean up.
   g. View film about Franklin, Ohio: Clean Town U.S.A.

6. Discussion Questions:
   a. What do you think pollution means?
   b. When does a waste product become a pollutant?
   c. How many types of pollutants did we identify?
   d. What can our community do to help eliminate pollution?

e. What has Franklin, Ohio done about its waste problem?

f. How are the solid wastes of Franklin, Ohio recycled?

g. What uses are there for the recycled products?

h. What natural resources can be conserved by recycling waste products?

i. Why don't all communities have waste recycling plants like Franklin, Ohio?

7. References:

The Real World Books on Pollution:

The Waters of the Earth
The Air We Breathe
The Land We Live On
The Dangerous Atom
The Noise We Hear
The Food We Eat
The Balance of Nature
The Population Explosion

Jones, Claire: Gadler, Steve J.; Engstrom, Paul H.
Learner Publications Company, Minneapolis, Minnesota 1971.

Junior High

B. Diane Boyd

How Pollution Harms Us

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Too much pollution normally results in damaging the environment.

3. Time: 2 - 3 days (1 hour periods)

4. Materials:

    a. A recent map of your community.
    b. A map of your community that is approximately 25 years old.
    c. A map of your community that is approximately 50 years old.
    d. Cameras (approximately 1 per 5-6 students)
    e. Film

5. Procedure:

    a. Divide the class into 3 groups. The first group will study the recent map, the second the 25 year old map, etc.

    b. The groups will interview citizens after school. The first group will interview the community as it exists today. The second group will interview citizens who have lived in the community for 25 years, and the third group will interview the elderly who have lived there for 50 years.

    c. Make up a questionnaire with the students. The following is a sample of questions that might be used:

        (1). What changes have occured since you have lived here?

        (2). Are you aware of any kinds of pollution in your area or nearby?

        (3). Specify the kinds of pollution you have observed. (For example, noise, air, visual, water, etc.)

        (4). Have you tried to change any of the sources of pollution?

    d. Collect and summarize the collected data.

    e. With the students, take a walking tour near the school site and photograph evidence of pollution. (You may want to sign out cameras for students who know of areas they may wish to photograph after school.)

6. Discussion Questions:

   a. Have the changes that have occured been harmful or helpful?

   b. How do citizens feel about the changes?

   c. What could have been done to prevent some of the harmful changes?

   d. Looking ahead, what changes do you foresee?

   e. Will these be harmful or helpful? Why?

   f. What can we do to prevent the harmful ones?

   g. What can we do as a class to begin to effect change?

   h. Can our plan be modified to be employed on a national level?

7. References:

   a. Environmental Education Instructional Activities. The University of the State of New York. The State Education Department, Albany, New York 12224. 1970.

Junior High

Jim Colliton

Noise Pollution

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Too much pollution normally results in damaging the environment.

3. Time: 3-5 days - day 1 - Introduction to equipment, noise pollution, areas of study
   day 2-5 - Collect data, draw graphs, charts

4. Materials:

   a. Pencil and paper
   b. Decibel meter
   c. Audiometer
   d. Stop watch

5. Procedure:

   a. Select 10 different areas in and around your environment and identify each.

   b. Observe and record volume and essential information regarding noise pollution.

   c. Each student should record two readings, at two different times, for each site.

   d. Students should record the different sources of each noise - man, plants, wind, cars, water, insects, echo, etc.

   e. In the classroom or comfortable site, students should compile information and compare data.

   f. Compile raw data so that the lowest to largest volume is shown. Compare to a decibel chart found in an encyclopedia.

6. Discussion Questions:

   a. In your opinion, which sounds are/are not pollution and how are/are not they damaging to the environment?

   b. What are the effects of noise pollution you've seen? Infer what has or is happening because of noise pollution.

   c. Are there any laws protecting the individual from noise pollution?

   d. Is there anyway to buffer or lessen some of your sources of noise? Explain.

   e. Can any of the sound(s) recorded be changed from endangering to not endangering or vice versa.

   f. What are some of the long and short term effects on the environment and people.

   g. Rank your group of noise pollution so that the most desirable is first and the least is last.

   h. Compare the above (g) to #5(f).

7. References:

   a. Environmental Education for the Seventies, Purdue University, 1973.

   b. Pollution. Mine Publications, Inc., 1971.

Junior High

Donald Courtright

Nature versus Pollutants

1: Concept to be developed: Ecosystem

2. Understanding to be developed: Natural cycles and systems have limited capacity to cycle or disperse pollutants.

3. Time: 5-6 days - day 1 - Overview of natural cycles and films
   Assign problem
   day 2 - Discussion of evidence of pollution & grouping
   day 3 - Group meetings & research
   day 4 - Research
   day 5, 6 - Panel presentations

4. Materials:

   Films: Cry of the Marsh
   Clean Town U.S.A.
   Film projector
   Pencils, pens, paper
   Access to library materials

5. Procedure:

   a. Discuss the meaning of pollution.

   b. Discuss ways man combats pollution.

   c. View the film Cry of the Marsh (12 min. color)

   d. Discuss man's destruction of nature's balance.

   e. View the film Clean Town U.S.A. (20 min. color)

   f. Discuss effort to recycle waste products

   g. Assign each student to find pollution problem

   h. Discuss problems

   i. Divide into groups of 5-6 with common pollution problems

   j. Research problem and prepare panel presentation

   k. Present panel discussions

6. Discussion Questions:

   a. What is meant by pollution?

   b. When does a waste become a pollutant?

   c. To what extent can nature eliminate the waste before it becomes a pollutant?

   d. What has man done to upset the balance of nature (1st film)?

   e. What steps are being taken to relieve our waste problems (2nd film)?

   f. What types of pollution do you find in your community?

   g. How are wastes gathered and disposed of in your community?

   h. How widespread is this pollution problem in your community? your country? your world?

   i. What can nature do to eliminate these pollutants?

   j. What has man done or can he do to help eliminate these pollutants?

   k. What do you see for the future of your compunity as far as the pollution problem is concerned?

7. References:

   a. Earth, the Great Recycler, Russell, Helen Ross. Thomas Nelson Inc. Nashville/New York. 1973.

   b. Pollution: The Real World Books

      The Waters of the Earth
      The Air We Breathe
      The Land We Live On
      The Dangerous Atom
      The Noise We Hear
      The Food We Eat
      The Balance of Nature
      The Population Explosion

   Jones, Claire; Gadler, Steve J.; Engstrom, Paul H.
   Lerner Publications Co. Minneapolis, Minnesota, 1971.

Junior High

B. Diane Boyd

A Closer Look at Trash

1. Concept to be developed: Ecosystem
2. Understanding to be developed: Natural cycles and systems have limited capacity to cycle or disperse pollutants.
3. Time: 3 - 5 days (1 hour periods)
4. Materials: (Optional)
    a. Information on sanitary landfills
5. Procedure:
    a. When the wastebasket is full, place its contents on the floor or table.
        (1). Look at what has been thrown away.
        (2). Ask members of the class to suggest ways that the discarded items could be reused.
    b. Have each student look through a wastebasket at home and list several items with suggestions as to how each discarded item might be reused.
    c. Plan a trip to a nearby sanitary landfill so the students can look at where their discarded wastes go.
    d. Point out the environment surrounding the landfill:
        (1). Is the area attractive?
        (2). Is there water nearby?
        (3). What effect might the landfill have on its surroundings?
    e. Instruct the students to visit a nearby store or to look at home for products that are in disposable containers or ones that have excess packaging. Ask them to list or bring in some of these products, discussing them the following day.
6. Discussion Questions:
    a. What happens when we discard an item?
    b. What happens to an item after our trash is picked up?

c. What will happen if we have more trash than space available to bury it?

d. Why do manufacturers produce items with excess packaging?

e. Why do we buy items with excess packaging?

f. What can be done to discourage manufacturers from producing non-recyclable items?

g. Where are some places where you might see an empty pop can?

h. What can be done as an individual to help?

i. What can be done as a class or school to help?

Junior High

Ann P. Sibole

Cookie Concerns

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Humans and natural resources are distributed unevenly around the earth.

3. Time involved: 30 minutes.

4. Materials: Bag of cookies with enough for everyone in the classroom
   Tape recorder and tape

5. Procedure:

   a. Dump the cookies out into two equal piles on separate trays. Start the tape.

   b. Give one tray to two people in the class and tell them they may have all they want of the pile.

   c. Give the other tray to the rest of the class to share. There should not be enough to go around in this pile. Be sure to notice every detail of behavior that takes place here.

   d. Let things go for a while without comment or explanation. They are role playing without knowing it!

   e. Ask them to settle down and stop the recorder.

6. Discussion Questions:

   a. Do you know why this activity was done?

   b. If cookies represent all the natural resources and wealth in the world, who do you suppose the two people with half the cookies represent?

   c. How did the rest of you feel? Do you suppose the poor in India, Brazil or Mexico feel the same way?

   d. How did the two Americans feel about their position in the class activity? Do you think your feelings are similar to the way the American public seems to feel about the lack of food, medicine and conveniences in other parts of the world?

   e. Play back the tape and stop to discuss interesting comments, trying to equate them to current world crises.

Junior High

Marilyn Ryden

Natural Resources vs. World Power

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Humans and natural resources are distributed unevenly around the world.

3. Time: 3 days - day 1 - Research, explanation of assignment
   day 2 - Finish research, compile data, complete chart
   day 3 - Discussion

4. Materials:

   a. Library
   b. Pencils and a felt pen (one color)
   c. Data tables for students
   d. Large data table for classroom use (poster board)

	Population	Water	Forests	Uranium or Plutonium	Petroleum	Agriculture (fertile soil)	Major Natural Resource
United States							
Soviet Union							
India							
The Netherlands							
China							
Chad							
Canada							
Kuwait							

5. Procedure:

   a. Prepare copies of the chart for each student.

   b. Prepare a large copy of chart for classroom use.

   c. Make sure students understand what a natural resource is.

d. Students (singularly or in groups) are to find out by library research if each of the countries listed have each of the natural resources listed.

e. Students should indicate on their chart if the country has the resource, and if it is considered a major resource in that country.

f. Students should also find the population of the country and list it on the chart.

g. Students should also find the major resource of each country and list it on the chart.

h. When all the information has been gathered it can be entered on the large chart by the following method: If a country has the resource listed as a major resource, color in the appropriate block. Fill in population number and the major natural resource.

i. The chart should be done in all one color felt pen to eliminate the confusion of a number of colors on the chart.

6. Discussion Questions:

a. What is world power? How is it determined?

b. What are the countries with the greatest and the least natural resources?

c. How do the countries with the greatest and the least natural resources rank in world power?

d. Can you see a relation between a country's natural resources and its position as a world power?

e. Are there any countries with a lot of natural resources but with very little world power?

f. If you were in a government with a lot of natural resources but with little world power, what could you do to obtain more world power? Can you give any examples of methods which some governments have actually used?

g. What is supply and demand?

h. Why do some countries with many natural resources have so little power? Are these countries using their natural resources wisely? Could there be other reasons for their lack of power?

i. Does the population of a country necessarily make it a world power or a strong country? Can a very large population in a country be more of a disadvantage than an advantage? Can you give examples?

j. What are some other important natural resources besides the ones listed on the chart?

7. References:

a. Encyclodedia
b. National Geographics
c. World Geography texts

High School

Ann P. Sibole

Affect of Sulfur Dioxide on Vegetation

1. Concept to be developed: Ecosystem

2. Understandings to be developed: An ecosystem is complex and extremely vulnerable to sudden or long-term disturbances.

3. Time: 2 days to set up; perhaps several weeks to run.

4. Materials:
    - seed (alfalfa, barley, radish, lettuce, bean or aster)
    - 2 flats for plants
    - 20 - 30 flower pots for transplanting
    - soil
    - 2 small greenhouses, 3 x 3 feet, built of wood frame and plastic covering
    - plastic tubing
    - tape and heavy duty stapler
    - small electric fan to circulate air and gas in greenhouses
    - pressure reducing valve
    - 1 cylinder containing sulfur dioxide
        - a small one - 1.25 ppm sulfur dioxide for short time fumigation (about 1 to 2 hours)

    (All obtainable through Matheson Co., E. Rutherford, N. J. or Scott Laboratories, Inc., Perasie, Pa. or other local gas suppliers.)

5. Procedure:
    a. Plant seeds and transplant ahead of time.

    b. Construct green houses with gable roof.

    c. Find location outside for this experiment, within reach of electricity and preferably on the school roof or in a court yard where it can be left for some time undisturbed.

    d. Hook up plastic tubing so it is air tight for adding gas to the greenhouse atmosphere.

    e. When one greenhouse is fumigated, the other will serve as a control - not exposed to SO_2 at all.

    f. Attach a length of plastic tubing to the pressure reducing valve and attach the other end to the tubing on the greenhouse.

    g. Open the valve and allow the SO_2 to enter the greenhouse.

    h. Start the fan - be sure there are some holes in the side of the greenhouse where the fan is operating to circulate the air inside.

i. Students should be instructed to keep track of the following:

1) watering frequency

2) rate of plant growth - height measurements in both greenhouses

3) length of time the plants were exposed to SO_2 and the approximate concentration

4) date of appearance of damage to leaves and description of injury

5) take color slides of damage as it occurs, compared to normal leaves

6. Discussion Questions:

a. What might be the source of SO_2 in the atmosphere?

b. What happens when SO_2 in the atmosphere combines with rain droplets in a shower? What compound is formed?

c. Can you suggest how this compound might affect plant growth?

d. When SO_2 is absorbed by the leaves of the plant, the injury occurs. How does SO_2 or any other gas enter the leaves?

e. Plants are more resistant to SO_2 at night than during the day. Explain this on the basis of your answer to d. (Check your biology text on photosynthesis if necessary.)

f. Describe the affect of SO_2 on plant growth and leaf development.

g. On the basis of this experiment, do you feel that plants be vulnerable to injury and disease from certain air pollutants besides SO_2? What are some other common pollutants which should be studied to see what affect they have on plant growth?

7. References:

a. Any high school or college biology text.

b. Any number of books out on air pollution such as:
Air Pollution, Stern, Arthur C. Academic Press:New York. 1968.

Senior High

James Seurynck

Understanding

1. Concept to be developed: Ecosystem.

2. Understanding to be developed: An Ecosystem is complex and vulnerable to sudden or long-term disturbances.

3. Time: 3 - 4 weeks--preparation-field trip-evaluation.
The actual field trip requires about 6 hours if done by well-prepared students. This can be done in one day or a few hours for several days.

4. Materials:
   - notebooks and pencils
   - topographical maps
   - aerial photographs
   - labels and marking pens
   - collecting jars for soil and insects
   - hand lenses
   - trowel or small shovel
   - soil sampler
   - soil thermometer
   - soil testing kit
   - sling psychrometer
   - wind velocity gauges
   - therometers (air)
   - light meter
   - clinnometers
   - binoculars
   - field study guides
   - increment borer (if available)

5. Procedure:

   a. Introduce the concept of ecosystems and develop a working knowledge of the following terms: ecology, ecosystem, biotic, abiotic, biome, community, niche, succession, autotrophic, heterotrophic, carnivore, herbivore, food chain, web, producer, consumer, and decomposer. (See textbook sources.)

   b. Show various movies recommended introducing the ecosystem concept and following up with movies on specific types of biomes. (Discuss with students.)

   c. Select a local wood lot that has been relatively undisturbed by man. A mixed woodlot usually contains a diversity of organisms. The ideal time to study your field site is when it is fully developed vegetatively, although much can be learned by studying your site at various phases.

      If a woodlot is unavailable for study, a local park or farmland will give good results. In both of the latter an added study of man's influence on an ecosystem could be incorporated into your investigation.

d. A pre-field trip examination of topographic maps and aerial photos of the region will give the student an insight as to the relative location of the site, topography of the area, the influence of streams or rivers and the overall function of the site in the broader ecosystem.

e. At the site select a topographic high point on the perimeter to observe the study area. Using your topographic maps and aerial photos sketch a general overview of the area in your notebook, noting the boundaries of the actual study area. Be sure to include prominent land features that can be used as reference points in your study.

f. Approach your study area slowly in small groups. Visit the areas you have designated on your map as possible study sites. Observe the vegetative growth noting the dominate types of plants. Can you detect a succession of plant life as you enter the study area from grasses to shrubs to trees? What types of trees appear most abundant?

g. Be observant as to the animal life using binoculars to help in identification. Not the location and abundance of the particular species. What stratum was it in? Was it at the edge of the site or in the interior?

h. Regroup at a predetermined site to discuss findings and evaluate. At what successional stage is the site in? Designate specific areas to be studied (100 M^2 or less depending on the size of the study site.) by each group. (Try to diversify your areas of study.) Identify the vegetative species in the quadrant assigned you. Describe the abundance of each species as freguent (f); occasional (o); and rare (r).

i. Study the animal life in your quadrant using the collecting instruments available. Look particularly for insects and arthropods. Be sure to note the location and vegetation where the animal was found. Use hand lens to observe small animals. (Anatomical parts will help determine the niche of the animal._

j. Investigate the following abiotic factors in your quadrant: light intensity, relative humidity, wind velocity, soil and air temperature and soil conditions using testing kits and various instruments provided.

Some additional studies if time permits.

a. Leave pieces of wood (10 CM x 10 CM) in designated areas to be observed in 2-3 weeks. Note the various animals that have gathered on your board.

b. If an increment borer is available, sample and preserve cores of specified trees you feel will give you an insight into the past history of the woodlot.

c. If areas of the woodlot appear to be extensively used by humans, try to determine their impact on the system.

6. Discussion Questions:

a. Write up and discuss in class the following:

Summarize the biotic and abiotic measurements, using data charts.

b. From your observations of the data collected, determine the influence of the biotic and abiotic factors on each other keeping in mind the ecosystem concept. How did the abiotic factors affect vegetation?
How did vegetation modify soil, air, etc.?
Did you observe plant-animal relationships?

c. Determine as many food chains as possible from your observations. Try to establish a food web for your site.

d. Bases on your observations, is this site being used properly? If not, what would you recommend to insure its' proper use in the future?

Follow-up:

1. Find out from the owner(s) of the site what they propose to do with it in the future. (You may be able to suggest some ideas based on your findings.)

2. Research a particular animal you found interesting. (It's fun to predict the habits of the animal and then substantiate your predictions.) Report to class.

3. Study or research an ecosystem you would not find in your geographic area. How does it differ from your ecosystem? What were the major influential factors in causing the diversity observed?

7. References:

a. A Guide to the Study of Terrestrial Ecology, William A. Andrews, Prentice Hall, 1974.

b. Basic Ecology, Ralph & Mildred Buchsbaum, Boxwood Press, 1957.

c. Biological Science: An Ecological Approach, B.S.C.S. Rand McNally, 1973. (Green edition)

d. Readings in Conservation Ecology, G.W. Cox, Meredith, 1969.

Senior High

Linda Brigham
Diane Haskell

Lawn Study

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Human beings are capable of strongly altering the cycles and systems of the earth.

3. Time: 1 - 2 weeks

4. Materials:

   a. Soil analysis kit
   b. Access to two lawns at opposite ends of the continuum (for comparison purposes)

5. Procedure:

   a. Discuss the normal mineral cycles that take place on a lawn in which fertilizers, pesticides, herbicides are not used.

   b. What effects do fertilizers, pesticides, herbicides, and grass catchers have on the mineral cycle described above?

   c. Prepare a soil analysis on a lawn containing monoculture grass, and prepare an analysis on a lawn containing a wide variety of plant species.

   d. Survey the lawns along several streets around your community to determine the following usage:

      (1). Soil tested before applying fertilizer
      (2). Fertilizer used
      (3). Herbicide used
      (4). Pesticide used

6. Discussion Questions:

   a. What did you observe about the color and texture of each lawn?

   b. Which type of lawn required more care and was more costly to maintain?

   c. From the information learned from soil analysis, were beneficial chemicals being applied?

   d. Is what you observed in the street around your community typical of your community? State? Nation?

   e. What consequences might occur if what you saw continued to be the pattern over time?

   f. Does lawn care effect other ecosystems?

Senior High John L. Adams

Nuclear Modification

1. Concept to be developed: Ecosystem

2. Understanding to be developed: Human beings are capable of strongly altering the cycles and systems of the earth.

3. Time: 5 days - (Note advanced time required for reading assignment.)

4. Materials:
   a. Hiroshima
   b. On the Beach
   c. Notebooks for gathering environmental data.

5. Procedure:

   a. Assign well in advance (depending on student level) the above two books.

   b. In class define, or get students to define, a cycle or system. Strong recommendation for in class reading: "Recycling, an old Idea with New Significance" from The Conservationist, June-July, 1971.

   c. Assign students to observe the following and take notes to be shared in class discussion:

      1. Home heating system - how is it a closed system? What cycles are involved? Etc.

      2. The classroom environment - good and bad features. Recommended improvements.

      3. School environment. Presence or absence of trees, wild life, plant life. How much of this is natural--how much created by man?

      4. Shopping center--compared to school, using similar criteria.

      5. Local community.

6. Discussion Questions:

   a. Which systems or cycles you observed were protected by man? Which were being destroyed?

   b. How would you improve the environments you observed?

   c. What actions by man can preserve natural cycles or systems?

d. Which actions can disrupt them?

e. How is man's psychological/sociological behavior altered as the scientific systems are changed?

f. In the book, Hiroshima, how does the author bring out changes in human behavior due to man's alteration of the environment?

g. How does the chapter, "Panic Grass and Fever few" relate to the idea of a cycle or system? What is the underlying meaning or symbolic comment here?

h. Which behavioral cycles were upset due to the bomb? How did mankind compensate for the changes in his environment?

i. How are irony and paradox a natural result of upsetting one's environment?

   1. Things which are normally vulnerable survive the Blast, while seemingly indestructible objects vanish.

   2. No noise at ground zero-only heard miles away.

   3. Great leveling of social status.

j. What are the main differences between On the Beach and Hiroshima?

K. In what way is On the Beach a novel of despair over mankind's upsetting the natural environment.

l. Imagine that the areas you analyzed in the notebook underwent an atomic (nuclear) experience, i.e. direct hit or fallout. Select one of the sites and rewrite an entry explaining how it would have changed. Be descriptive and realistic (Include vegetation, people, buildings, weather.)

7. References:

a. Population Resources Environment (Issues in Human Ecology). Erlich and Erlich. P. 150. See Aswan Dam project.

b. "Forecasting the Future of Spaceship Earth." Science Teacher 40: 28-30 December, 1973.

c. "Snow Sampling". Science Teacher, 40: 38-39. Nov., 1973.

d. The Biosphere, A Scientific American Book.

e. The Closing Circle, Barry Commoner, Nov. 1972.
(See especially--chapter 3, "Nuclear Fire"
chapter 11, "The Question of Survival")

f. "Recycling: An Old Idea with New Significance." The Conservationist, June-July, 1971.

Senior High

James Seurnyck

Community Structure

1. Concept to be developed: Ecosystem.

2. Understanding to be developed: More diverse communities tend to be more stable.

3. Time: 5 - 6 days -- 2 days-field trips
   3-4 days - evaluation and discussion.

4. Materials:
   a. Notebook and pencil
   b. identification guide books
   c. Collecting jars for soil samples and insects
   d. insect nets
   e. insect aspirators
   f. trowel
   g. air and soil thermometers
   h. soil test kit
   i. light meter
   j. sling psychrometers.

5. Procedure:

   a. Take students on a field trip where a community can be studied. Using the materials available, proceed to investigate the area as to diversity of populations. A mixed hardwood woodlot or forest makes an excellent study area.

   b. Make a list of as many plant and animal populations of the study area as possible.

   c. Construct a food web for the area studied (You may want to research the characteristics of the plants and animals of your community as a guide to constructing your food web.)

   d. What biotic factors limit the diversity of population in this community?

   e. Determine as many abiotic factors of your community as possible, ie., soil, climate, etc. How do they limit the diversity of population?

   f. Study the school lawn as a community, evaluating its biotic and abiotic factors.

   g. Establish a food web for the lawn.

6. Discussion Questions:

   a. Which community had the greater population diversity?

b. Hypothetically introduce a natural predator or parasite into each community. Example: Dutch Elm disease into your mixed hardwood woodlot: a common lawn problem such as leaf fungus, grubs, etc can be used for your lawn.
Which community was most adversly affected by the introduction of the new species?

c. Explain the statement "Complexity is, in part, responsible for the stability of most ecosystems."

d. Explain the statement "Man's activities tend to reduce the complexity of ecosystems."

e. How does the statement if #4 apply to
   1. a farmer growing a crop?
   2. A shopping center with large parking lots?
   3. engineers channelizing a river?
   4. consumption of natural resources?

f. How is diversity of population important to a landscapper?

g. How do pesticides affect the diversity of population?

h. What are some alternatives to pesticides for controlling undesirable insects?

i. Use the idea of "the stability of an ecosystem is proportional to the complexity of the system" to evaluate the economic stability of your community.
Do the majority of jobs rely on a particular industry?

7. References:

a. Pesticides and the living Landscape, R.L.Rudd, U. of Wisc. Press, 1964.

b. The World of Living Things. Brandwein Beck, Strahler, Hollingsworth and Brennan.

c. Environment Resources, Pollution and Society. William Murdock Simauer Associates, Inc. 1971.

d. Concepts of Ecology. E.J.Kormondy. Prentice-Hall, Inc. 1969.

e. The Distribution and Abundance of Animals. H. G. Andrewartha and L.C. Birch, University of Chicago Press. 1954.

f. Plants and the Ecosystem. W.D.Billings. Wadsworth Publishing Co. 1964.

g. The Study of Plant Communities. H. J. Oosting. W.H.Freeman & Co. 1956.

h. Ecology and Field Biology. R.L.Smith. Harper & Row, Inc. 1966.

I. The Life of the Forest. J. McCormick. McGraw-Hill. 1967.

J. A Guide to the Study of Terrestrial Ecology.
Wm. Andrews et. al. Prentice-Hall. 1974.

Films:

1. Population Ecology (19 minutes. color) E.B.F.
2. Cave Community (13 minutes color) E.B.F.
3. Community, (10 minutes color) E.B.F.
4. Desert Biome (22 minutes)
5. Distribution of Plants and Animals (17 minutes color) E.B.F.
6. Grasslands (17 minutes color) E.B.F.
7. High Arctic Biome (23 minutes color) E.B.F.
8. Temperate Desidious Forest (17 minutes color) E.B.F.
9. Conservation and Balance in Nature.
10. Vacant Lot
International Film Bureau, 332 S. Michigan Avenue, Chicago, Illinois. 60604.

Senior High

Patrick A. Miljour

Study of an Invertebrate Community

1. Concept to be developed: Ecosystem

2. Understanding to be developed: More diverse communities tend to be more stable.

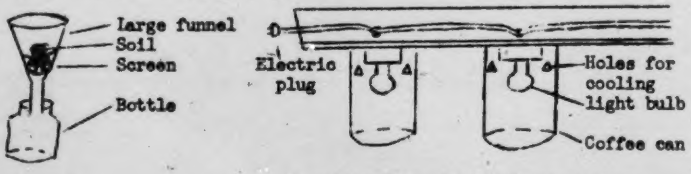
3. Time: 2 days - day 1 - Field trip and assemble apparatus
   day 2 - Classification of organisms, compile data, discussion

4. Materials:

   a. Large funnels
   b. Fine screening or cheesecloth
   c. Light source
   d. Collecting jars
   e. Shovels or large spoons
   f. Containers for soil samples (small cans)
   g. Pencils and paper
   h. I.D. books
   i. Data chart for the numbers and types of organisms found in soil samples:

Sample	Number of Different Organism Types	Number of Each Type of Organism
1.		
2.		
3.		
4.		
5.		

   j. Diagram of Berlese apparatus:



As many coffee can light sources as wanted can be placed on the board. Wire the lights in parallel.

5. Procedure:

   a. Students will work in pairs or groups of 3 and make a soil collection from various habitats. Example; beach, forest litter, farm field, school yard, old farm field, etc.

   b. Using a spoon or shovel each study group will collect one soil sample from the locality they chose. This will be placed into a container and brought back to class.

   c. In the classroom, each student will set up his berlese apparatus as shown in the diagram.

      (1). Place a screen in the bottom of a large funnel and place your soil sample on top of it or wrap a layer of cheese cloth around the soil and place in the funnel.

      (2). When several other groups have their apparatus assembled, place the light sources over them.

   d. The following day observe the organisms found in the jar, dividing them into phylums and classes. Example; Nematoda (roundworms), Platyhelminthes (flatworm), Annelida (segmented), Crustacea, Arachnid, Gastropoda.

   e. Fill in the data chart listing the number of organisms of each different type, and the number of each type of organism.

6. Discussion Questions:

   a. What soil type has the greatest number of organisms? What soil sample has the greatest number of organism types? Why?

   b. What soil type has the least number of organisms? What soil sample has the least number of organism types? Why?

   c. Why did you have the light on?

   d. What is the function of the screen?

   e. Is there a correlation between soil complexity and the number of types of organisms, or the number of organisms present?

Senior High

James Seurynck

Future Energies

1. Concept to be developed: Ecosystem.

2. Understanding to be developed: Fission and fusion are two relatively new sources of energy.

3. Time: 1 week

4. Materials:

5. Procedure:

   a. Construct a timeline from the beginning of the use of energy to the present. (Let 1CM = 10 years). Consult your library for the earliest date that the following materials were used as a source of energy: wood, coal, natural gas, petroleum, liquid natural gas, water, and nuclear matter. Plot the dates on your timeline. This should give you an idea of the nuclear age compared to other fuel sources.

   b. Do the research topics suggested. They may be done individually or in groups.

   c. Present topics in class using audio-visual aids where appropriate.

   d. Open floor to discussion of topics.

6. Discussion Questions: (Topics for Research)

   a. What is the source of nuclear energy? (Include transmutation of elements by radioactive decay and types of radiation.)

   b. How is uranium mined? Mineral sources, geologic features containing uranium bearing ores. Countries in which uranium ores are found.

   c. Research the history of nuclear fission including men responsible for development.

   d. How does a nuclear power plant work?

   e. What is atomic fusion? What is its history? What are some problems in using atomic fusion?

   f. What is thermal pollution? How can this change an ecosystem? What are some ways it is being controlled?

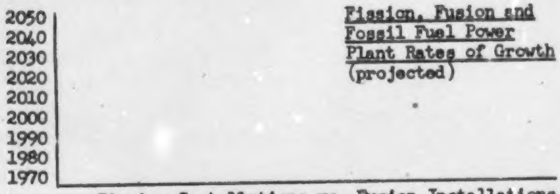
   g. What are radioactive waste pollutants? How is it harmful to our environment? What is being done with this material?

Senior High

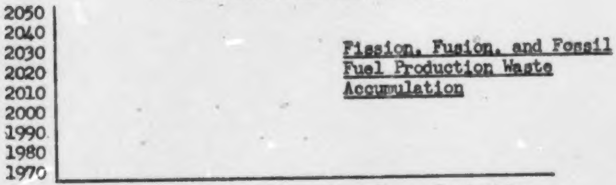
Neal F. Moore

Fission and Fusion

1. Concept to be developed: Ecosystem
2. Understanding to be developed: Fission and fusion are two relatively new sources of energy.
3. Time: 5 days - day 1 - Preliminary research
   day 2 - Field trip to power plant
   day 3 - Field trip to DNR Regional Office
   (alternative: send letters)
   day 4 - Compile data
   day 5 - Discussion
4. Materials:
   - a. Access to local Consumers power plant (regular and/or nuclear) or office
   - b. Library
   - c. Access to DNR Regional Office
   - d. Camera
   - e. Pencil
   - f. Graph paper
   - g. Colored pencils and pens
   - h. Rulers
   - i. 2 graphs per pupil:



Fission Installations vs. Fusion Installations vs. Fossil Fuel Installations



Waste Products Resulting From Power Production in Fossil Fuel, Fission and Fusion Plants

5. Procedure:

   a. Research the basic principles of the fusion and fission nuclear mechanisms in the library.

   b. Research the basic mechanisms of burning coal, oil, and gas.

   c. Research the up-to-date performance of the three types of power plants.

   d. Prepare a list of 10 questions for interview with the Consumers Powers personnel and the DNR personnel concerning the following areas:

      (1). Cost
      (2). Safety
      (3). Pollution
      (4). Efficiency of fission vs. fusion vs. fossil fuels power outputs

   e. Interview Consumers Power people about existing nuclear power plants and fossil fuel installations, and projected plants.

   f. Visit one site of each type.

   g. Take pictures, where permitted, of the installations and environments.

   h. Interview with DNR personnel.

   i. Day 3: Back in classroom, compile figures and make a ditto master copy.

   j. Groups of five should discuss their views on the responses to the interviews and compare them to the information found in preparatory research.

   k. Day 4: Group results should be discussed and pictures presented where appropriate.

   l. Graphs should then be constructed.

   m. A general class concensus should be arrived at as to whether the advantages of the two new forms of power source, fission and fusion, outweigh the disadvantages, and outweigh the advantages of fossil fuels, coal, oil and gas.

6. Discussion Questions:

   a. Does the data given by the representatives of each side correspond to the data found in the research?

b. If not, what are possible sources of discrepancy? Are the sources significant? Discuss. Are the discrepancies significant? Discuss.

c. What do the pictures show of the relationship of fossil fuel installations to the environment?

d. What do the pictures show of the relationship of a fission power plant to the environment?

e. What advantages do the projected values of each graph show? What disadvantages?

f. Do the graphs illustrate environmental pollution-free plausibility?

g. How do the data on the graphs relate in relationship to using the two new energy sources as a workable solution to the assumed-diminishing fossil fuel supplies?

h. What are some possible alternatives?

7. References:

(A cross-section of represented sides)

a. AEC, Understanding the Atom Series, (diagrams of nuclear fission and fusion process)

b. Consumers Powers public relations materials, Environmental Quality, A curriculum series.

c. Detroit Edison - Nuclear Power Plant

d. National Wildlife, on energy. Feb.-March, 1973.

e. Poisoned Power. Gofman.

f. Environmental Action Bulletin, Rodale's, March 1974, Energy Issue.

g. Environmental Action Bulletin, Rodale's, May 1974 Nuclear Power, Parts I and II.

CONCEPT

POPULATION

UNDERSTANDINGS:

A. Lower Elementary (Kdg., 1st and 2nd)

1. A population is a group of plants and animals of the same kind living in the same area.
2. Populations interact with each other and their environment.
3. Populations are a part of a given community.
4. The human community is closely interrelated with its environment.

B. Middle Elementary (3rd and 4th)

1. Populations increase, decrease, or stabilize depending on their interactions with each other and their environment.
2. The life style of a human population can affect the environment in significant ways.

C. Upper Elementary (5th and 6th)

1. Human beings both produce and consume materials.
2. Human populations have different standards of living which produce different environmental consequences.
3. As human populations grow, it becomes more difficult to attain and maintain environmental quality.

D. Junior High (7th and 8th)

1. Population changes like births, deaths, growth rates and migration patterns affect individuals, their surroundings and society.
2. The U.S. consumes a disproportionate amount of the earth's resources.
3. Populations have birth rates, death rates, growth rates, densities, immigration rates, emigration rates and age structures.

E. Senior High (9th, 10th, 11th, and 12th)

1. As long as a few countries consume a disproportionate quantity of the earth's resources, while other countries need these resources, there will be political instability in the world.
2. Different sectors of populations have varying degrees of access to natural resources they need in order to survive.
3. Any position on human population policy has personal, social, ecological, political, and economic implications.

Lower Elementary **Marlene Decker**

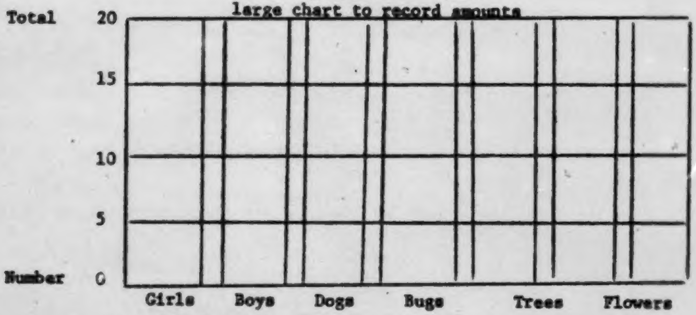
AREA POPULATION STUDY

1. Concept: Population.

2. Understanding to be developed: A population is a group of plants and animals living in the same area.

3. Time: One day of introduction then two weeks, two days a week (not full days for this age group).
   Day 1: Field Trip
   Day 2: Compile data, discuss, chart
   ---Repeat each week---

4. Materials: Local field or large yard
   paper and pencils for trip
   colored pencils for chart
   large chart to record amounts



5. Procedure:

   a. Introduction Day: Look at the other students describe and count them.
   b. Discuss a few differences, stress similarities especially the facts that they are all people, they attend the same school, are in the same grade, etc.
   c. State a simple definition of "population" as stated in the above understanding to be developed.
   d. Before taking the short walk to the nearby field review the concept of population. Then divide into two groups-dog counters and bug counters.
   e. While on the trip the children will count how many bugs or dogs they see and record the number on their own piece of paper. These will be pasted on the classroom chart under the appropriate heading for later use.

5. Procedure - (continued)

   f. On the second day discuss the trip and what was seen; how many animals, different kinds, etc. Record the numbers on the chart and review the idea of population.
   g. Repeat steps d, e, and f, using the same location but counting plants (ex. trees and flowers).

6. Discussion Questions:

   a. What does the boy/girl next to you look like?
   b. How many people are here in the room?
   c. How is he the same/different than you?
   d. Who can tell me what a population is?
   e. What animals did you see on our trip?
   f. How many bugs/dogs were there?
   g. Were the bugs/dogs alike or different?
   h. How many trees/flowers did you see on our trip?
   i. Were the trees/flowers alike or different?
   j. Are trees (flowers, dogs, bugs) a population? Review definition if necessary.

7. Other Activities:

   a. Make a collage of magazine pictures to show other populations. This can be an individual or group activity.
   b. Make a list of other populations in the same field or expand to the city as a base.
   c. Assemble an aquarium showing a fish population. Keep watching and discussing the population and how it changes.

8. References:

Interaction of Man and the Biosphere, Teachers Ed.
Rand McNally and Co. Chicago, 1970.

Lower Elementary

Talbert B. Spence

Populations of a Vacant Lot

1. Concept to be developed: Population

2. Understanding to be developed: A population is a group of plants and animals of the same kind living in the same area.

3. Time: 1 day

4. Materials: Film: Life in a Vacant Lot. 10 minutes (interrelationships of organisms living in an urban vacant lot).

5. Procedure:

   a. Introduce and explain the following terms:

      1. urban
      2. lot
      3. animals
      4. nature
      5. air
      6. vacant
      7. community
      8. plants
      9. water
      10. environment

   b. Show film Life in a Vacant Lot, 10 minutes. Discuss why this lot is vacant. Have students identify the different populations living in the vacant lot environment.

   c. Ask students what they think about how the living population of the vacant lot gets its food, water, and air.

   d. Ask students who do they think owns the vacant lot; and what are some ways that the lot could be used by the community.

   e. Have students express their feelings about the vacant lot by drawing a group mural depicting the various populations that they think are living in the lot.

6. Discussion questions:

   a. What does the word "urban" mean?
   b. What does the word "nature mean?
   c. What is a vacant lot?
   d. What does the word "population" mean?
   e. Why do living things need water?
   f. Why are there vacant lots in the city?, in the country?

7. Follow-up activity: Have students investigate a neighborhood vacant lot to see what kinds of organisms live there. Have students construct a large mural depicting the vacant lot.

8. References: Life in a Vacant lot, 10 minutes. The University of Michigan, Audio-visual Center, Ann Arbor, Michigan.

Lower Elementary

Judy Rose

A SCHOOLYARD INVESTIGATION

1. Concept to be developed: Population

2. Understanding to be developed: Populations interact with each other and their environment.

3. Time: 3 sessions - session 1 - a story and pictures
   session 2 - examine the schoolyard
   session 3 - discussion and play acting

4. Materials: Insect pictures for the bulletin board
   Two books - Tall Grass Zoo
   The Inch Worm

5. Procedure:

   a. During the first session read one or both of the books suggested. Discuss what is pictured on the bulletin board.

   b. During the second session investigate the schoolyard grass for insects and other organisms you might find there. After your examination of the yard, have the children help you to make a list of the things that you found on the investigation. Record your findings under the following headings:

Insect	Where did it live	What was it doing

   c. During the third session discuss the insects and their needs. Let each one of the children choose an insect and dramatize its form of locomotion, eating, habits, life style, etc. For example, some children might build an ant hill with big blocks. Encourage the children to tell how it feels to be their kind of insect.

6. Discussion:

   a. How could the things that live in the grass help each other?

   b. Do you think some of the things in the grass are scared of each other?

   c. What are some of the special needs of the insects in the schoolyard grass?

   d. What are some things that all living things need?

   e. Do people make some problems for the small things living in the grass?

   f. What have we learned about the way insects and other things live together in our schoolyard?

Lower Elementary

Talbert B. Spence

Community

1. Concept to be developed: Population.

2. Understanding to be developed: Populations are part of a given community.

3. Time: 1 day.

4. Materials:

   a. Film: Life in a Garden; 12 minute, color (deals with animal populations in a garden).

   b. Art paper and supplies.

   c. Chart paper and markers.

5. Procedure:

   a. Introduce and discuss the following terms:

      1. community
      2. population
      3. animals
      4. plants
      5. garden
      6. water
      7. food
      8. air
      9. shelter
      10. love
      11. life
      12. nature

   b. Discuss the different members of the garden population. Show film Life in a Garden. Relate to students that the garden is a community and that all the animals and plants are the population of this community.

   c. Have students express what they feel makes up a good population by having them do a group mural depicting a garden community of their own creation and to have a population for it.

   d. Discuss with class, what might have happened if the population of the garden community were to grow. What would happen to available food supply.

   e. Discuss what affects would occur if the garden community were not able to get enough water and sun.

   f. Discuss the affects of love will bring to the garden community.

6. Discussion questions:

   a. What are animals?
   b. What does the word community mean?

c. What does love mean?
d. What is a garden?
e. What is a flower?
f. What does nature mean?
g. What is the population in this class?
h. What is the population in your home?
i. What does food supply mean?
j. What does life mean?
k. What does the word cooperation mean?

7. References: Life in a Garden; 12 minute, color. University of Michigan, Audio-Visual Center, Ann Arbor, Michigan.

Early Elementary Agnes Corner

Population Needs

1. Concept to be developed: Population

2. Understanding to be developed: Populations are part of a given community.

3. Time: Five days. Day 1 - Discussion of what a "community" and a "population" is.

   Day 2 - Discussion of what a population's need are in order to survive.

   Day 3 - If needs are not met what happens.

   Day 4 - Field trip.

   Day 5 - Speaker.

4. Procedure:

   a. Show slides of population of as many different local animals and plants - if slides not available use books or pictures from magazines. Discuss terms "population" and "community".

   b. Discuss what they themselves need in order to live. Do the same for one familiar animal or plant, realizing our needs are the same.

   c. How relate to tragic happenings such as fire: spoiling of natural habitat, etc.

   d. Field Trip: Locate within walking distance of school a place set aside for the plants and animals of our community.

   e. Have a D.N.R. person come and speak to the children on what they are doing and what the children can do to help. (Be sure speaker can adapt to age group.)

5. Questions for discussion:

   a. What does fire (or other tragic happening) take from the plants and animals? What must they do to survive?

   b. If a farmer plows the soil and fences the area, where will the plants and animals go?

   c. If the animal is basically a water animal, what must he do if the water is removed?

   d. If a wooded habitat has been cleared for a super highway or a sub-division, what will the animals do?

   e. What can animal populations do that plant population cannot?

   f. What can we do to insure a good habitat for plants and animals in our community?

g. How can we encourage other children to not destroy or molest the plants and animals and their habitats?

6. Additional Activities:

Art: Draw pictures of areas suited for certain animal populations that have abundant plant life.

Language Arts: Role playing. Have the plants and animals talk to a bull-dozer or earth mover about helping to preserve good plant and animal habitats.

View the film: Say Goodbye

Social Studies: Draw map of community designating areas where there is a park or refuge area. Find if one is needed and where. Involve parent and community organizations interested in environmental education. If park or refuge area are or will be available, graphs could be made over a five year span of the number of kinds of populations and the increase or decrease in numbers.

Lower Elementary

Kathy Page

What is Water Pollution?

1. Concept to be developed: Population

2. Understanding to be developed: The community is closely interrelated with its environment.

3. Time: 1 day - Discussion and experiment

4. Materials: Pictures of water pollution mounted on poster board
   2 small aquariums
   charcoal filter, aquarium floss & charcoal

5. Procedure:

   a. Using the pictures as a starting point, conduct an open discussion about water pollution. Use the discussion questions as guidelines.

   b. Fill one aquarium with water. Attach a filter so that water is sucked up from one aquarium and filtered into the other.

   c. Put sand into the first aquarium and agitate it until the water's cloudy.

   d. Turn on the filter and afterwards examine the filter and the other aquarium for its contents.

6. Discussion Questions:

   a. Where do we get our water from?

   b. What do we use water for?

   c. What happens to the water after we use it?

   d. What does a sewage treatment plant do?

   e. If we dump sewage into a lake, what might happen to the fish?

   f. What is the 'pollutant' in our experiment?

   g. Who is the 'polluter'?

h. Is the water clear in the second tank?

i. How did we clean up our water?

j. Water is in the filter that make the water clean?

k. Who cleaned up the water?

7. References:

a. McDonald's Ecology Action Pack, McDonalds Corporation. 1972.

b. Energy Conservation - Guidelines for Action, Michigan Association of School Administrators - Region 9. April 1974.

Dorothea Boehm

Lower Elementary

SURVEY OF REASONS FOR LIVING IN A COMMUNITY

1. Concept to be developed: Population

2. Understanding to be developed: The human community is closely interrelated with its environment.

3. Time: 3 days — day 1 - Background discussion
   day 2 - Send questionnaire home
   day 3 - Discussion of questionnaire results

4. Materials:
   Questionnaire (teacher prepared)

SAMPLE QUESTIONNAIRE

Dear Parents:

We are learning about the community and are making a survey to find out why people come to live here. Please answer the questions below and, if possible, return it tomorrow.

Sincerely,

1. How long have you lived in the community? ____________________

2. What were your reasons for coming to this community?
   (Circle those that apply)
   a. Employment opportunities
   b. Geographic area
   c. Recreational possibilities
   d. Relatives living in the area
   e. Other

3. How has the community changed in size? ____________________

4. What effect has this had on the following:
   a. Homes ____________________
   b. Highways ____________________
   c. Water supply ____________________
   d. The amount of pollution ____________________
   ____

5. **Procedure:**

   a. Prepare children for the survey by asking the question: Why do you think people choose to live in our community?

   b. Record the ideas presented and explain that we will be able to find the real reasons their parents came here by taking a note home and asking them to fill in the bottom part.

   c. Send questionnaire home to be returned the following day, if possible.

   d. Let the children help tabulate the results of the questionnaires on a large sheet of paper.

6. **Discussion Questions:**

   a. What did we find was the reason most of your parents came to live in this community? What was next, etc?

   b. Did we find that the community has become larger or smaller?

   c. What were some things that happened because of the change?

   d. What did we learn about the reasons some people choose to live in certain communities?

7. **Resources:**

   a. Slides of homes, construction, factories, parks, and schools in the community.

   b. Home movies of roads, workmen, etc., during the period of sewer installation in newer areas of the community.

Middle Elementary

Beverly A. Kavasch
Darlene A. Leland

STUDY OF A FRUIT FLY ECOSYSTEM

1. Concept to be developed: Population

2. Understanding to be developed: Populations increase, decrease, or stabilize depending on their interaction with each other and their environment.

3. Time: 1-2 weeks.

4. Materials needed:
   - 3 small jars.
   - 1 pair "run" nylon panty hose
   - 3 large strong rubber bands
   - 3 1-yard pieces of dark colored cotton material
   - Supply of fruit and other food
   - 3 vials of purchased fruit flies
   - Wall chart for recording daily observations

5. Procedure:

   a. Order three vials of fruit flies.
   b. Upon receipt of flies, place a piece of an apple and empty one vial of fruit flies in each jar.
   c. Secure a piece of nylon material over top of each jar as soon as flies are placed in jar.
   d. Label jars with "A", "B", and "C".
   e. Discuss with group what observations they can make about three groups.
      1. Request likenesses
      2. Request differences
   f. Put up wall chart with "Date", "A", "B", and "C" columns.
      1. Record first day's observations.
   g. Explain that the Groups "A", "B", and "C" are going to have different environmental conditions established for them from that date forward. Children should be reminded that accurate daily observations are important.
   h. Establish diets for three groups.
      1. Group "A" will be given small piece of bread, a piece of chocolate, and a piece of potato chip each day.
      2. Group "B" will be provided no additional food beyond original piece of apple.
      3. Group "C" will be provided a small piece of overripe fruit or vegetable matter each day.
   i. Cover jars with black cotton before leaving school and uncover in the morning just before food is added.
   j. Record daily changes which children observe in the fly groups.
      1. Comparisons should be encouraged.
   k. Results of different environmental conditions should become obvious in a very few days.
   l. The control experiment should be summarized with an evaluation period and discussion.

6. Discussion Questions:

   a. Did the population of fruit flies increase? In which jar?
   b. Did the population of fruit flies keep on getting bigger? Why?
   c. Did the population of fruit flies decrease? When? By how much?
   d. How do you explain this change in population size?

7. References:

a. Books and Pamphlets

1) Minnesota Environmental Sciences Foundation, Inc., Change in a Small Ecosystem, National Wildlife Federation, 1972.

2) Pettit, Ted S., A Guide to Nature Projects, W.W. Norton & Company, 1966.

3) Shugrue, Sylvia K. & Lamberton, Bernice, Environmental Education in the Elementary School, National Science Teachers Association, Washington, D.C., 1972.

4) Shuttlesworth, Dorothy Edwards, Exploring Nature with Your Child, Greystone Press, 1952.

b. Scientific Suppliers:

1) Carolina Biological Supply, Burlington, North Carolina
2) Cinco Scientific Supply, W. Seven Mile Road, Detroit, MI

Middle Elementary

Kathy Page

Goldfish Population Study

1. Concept to be developed: Population

2. Understanding to be developed: Populations increase, decrease, or stabilize depending on their interaction with each other and their environment.

3. Time: a month or more

4. Materials: 2 aquaria (a quart jar and a 10 gallon tank)
   8 goldfish (medium sized)
   fish food, plants, gravel

5. Procedure:

   a. Set up the 2 aquaria exactly alike with 4 fish in each one.
      1. Wash the two aquaria throughly with plain tap water.
      2. Put the gravel in the bottom of the tanks and put newspaper on top of the gravel.
      3. Pour tap water onto the newspaper slowly which prevents the gravel from being stirred up, until the tank is 3/4 filled.
      4. Take out the newspaper and arrange your plants.
      5. Put the newspaper on the surface of the water and gently fill the aquarium and let it stand for 2 days to evaporate the chlorine.
      6. Put the fish in 2 plastic bags, floating them on top of the water in the aquariums for ½ hour. Then release the fish.

   b. Make daily observations of the two aquariums ie. the number of fish present, aggressiveness, water conditions, etc.

   c. Afterwards you may wish to expand to other variables using aquaria of the same size, ie. plant life, food, snails.

6. Discussion Questions:

   a. What is different about the 2 aquaria?

   b. Are the fish in the large aquarium more aggressive? Why?

   c. Are there more fish in the small aquarium after a month? Why?

   d. How has the water conditions in the aquariums changed?

   e. Has the condition of plants changed in the aquariums?

   f. Draw the food chain sequence in the aquariums?

   g. What happens when the plants are removed? Why?

7. References:

   a. Sale, Larry L. & Lee, Ernest W. Environmental Education in the Elementary School. Holt, Rinehart & Winstron, Inc. 1972.

Middle Elementary

Barbara McMurray

SCHOOL TRAFFIC CONGESTION -- POPULATION STUDY

1. Concept to be developed: Population

2. Understanding to be developed: The life style of a human population can affect the environment in significant ways.

3. Time: 5 days - day 1 - take pictures of school entrances immediately before and after school beings.
   - day 2 - conduct a survey of how children get to school.
   - day 3 - construct a chart of the survey. Plot a curve to show how many get to school each way. Figure percentages.
   - day 4 - discussion of life-style and habit (how they affect us daily.) Use examples to prove points.
   - day 5 - decide what the problem is, and what possible solutions might be feasible. Simulation of all activities so far.

4. Materials: Camera (Instamatic) and film. Chart made up to show method by which each child gets to school. (Sample chart enclosed). Paper, crayons, other art materials for drawings of traffic scene. Resource person - policeman.

5. Procedure:

   a. Have children prepare cameras to take pictures of school driveway at peak time to capture traffic congestion. Prepare pictures to be set up in a display for school showcase.

   b. Have children prepare chart, by taking survey of how each gets to school.

   c. Students will connect points on graph to show various ways of getting to school and the percentages demonstrating how many use each method of transportation.

   d. Students will begin a discussion on life-style and habit, especially how these terms affect them and why.

   e. Groups will be formed in which plans for debates on traffic congestion at school will be discussed.

   f. A resource person, a policeman, will discuss the situation as he sees it — community and environment-wise.

   g. Students will discuss the talk by policeman — what was said, if children agreed, how it applied to them.

   h. Simulation of all discussions and activities.

6. **Discussion questions:**

   a. If given a choice, which way would you choose to go to school? Why?

   b. What does the chart show? Explain what results you get from connecting the points on the chart, and in determining percentages.

   c. What are the implications of the results of the graph?

   d. What would happen if all the children had their choices, concerning transportation to school? Why?

   e. What could happen if a population, all with similar life-styles, each took their children to school in the same way and at the same time?

   f. How would you solve this problem? Are there any other possible solutions?

   g. What might you personally do to help? What might others do?

   h. How would you begin in solving this problem? Who might you ask to help? Why?

   i. Design a plan by which the school might be more free of this traffic problem. Add a picture of what your school would look like then.

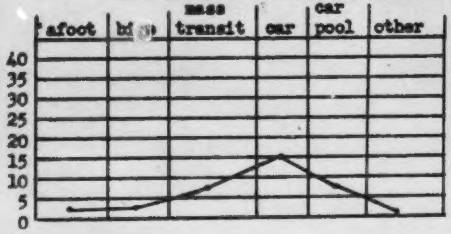
7. **Additional suggested activities:**

   a. Discuss congested traffic patterns at school. Children should divide into panels and plan debates on how to solve problems created by this congestion. These might be organized to present in the form of a program to parents or other people who are concerned with the problem.

   b. Make a film demonstrating the traffic problems at school, and how they might be solved.

   c. Design a type of news-letter to go home to parents, explaining the results of charts, pictures, comments by resource people, and any other pertinent information. This would be for the purpose of alerting parents to the family problem.

8. Chart: How Children Are Transported to School Each Day



$$\text{Percentages} = \frac{\text{\# students traveling a particular way}}{\text{total \# students in class}}$$

Afoot = %
Bicycle = %
Mass transit = %
Car = %
Carpool = %

Middle Elementary Talbert B. Spence

Life Style

1. Concept to be developed: Population.

2. Understanding to be developed: The life style of a human population can affect the environment in significant ways.

3. Time: 2 days.

4. Materials:

   a. Film: the "Ark", 20 minute, color, 1970.
   b. Art paper and supplies.
   c. Film: "Buttercup", 15 minute, color, 1971.
   d. Cameras.
   e. Chart paper and markers.

5. Procedure:

   a. Introduce and explain the term "life style".

   b. Discuss with students the different influences certain cultures life-styles have had on nature e.g., Indians - conservationist, White Society - urban slums., etc.

   c. Show the film the "Ark". Discuss with class that the film deals with how man's life style can and has influenced the environment. After viewing the film ask students to tell you what were the effects on the environment by man's life style.

   d. Take students out around the neighborhood and ask them to observe the life style of the community, e.g., big cars, little cars, no cars, neat front yards, junky front yards, friendly neighborhoods, unfriendly neighborhoods, etc.

   e. Have students take some slides of the community, have them discus the possible affects on the neighborhoods environmental quality due to different life styles.

   f. Discuss in class how people might change their life styles to be more responsible to the total environment.

   g. Show film "Buttercup" - have students pick out the different life styles present in the film, also pick out the type of environmental pollution shown.

h. Discuss how man has caused our world to be in the shape it is. Ask students to tell you how they would run the world, in order to make it a better place to live. This can be done either through a verbal expression or through a visual expression - art work.

6. Discussion questions:

   a. What is a life style?
   b. What does environment mean?
   c. What is a neighborhood?
   d. What is a flower?
   e. What does the word quality mean?
   f. What does the word responsibility mean?
   g. What does the word community mean?
   h. What does the word population mean?
   i. What does urban mean?
   j. What does rural mean?
   k. What does pollution mean?
   l. What does conservation mean?

Reference:

The "Ark" 20 minute color, 1970. The University of Michigan Audio-visual Center, Ann Arbor, Michigan.

Buttercup. 15 minute, color, 1971. The University of Michigan Audio-visual Center, Ann Arbor, Michigan.

Upper Elementary

Joannie Robb

GROWING A GARDEN

1. Concept to be developed: Population.

2. Understanding to be developed: Human beings both produce and consume materials.

3. Time: Several weeks in spring of year, 1/2 hour twice a week.

4. Materials: Garden plot, garden utensils, seed, fertilizer, and the following films- "Food Supply: Its Effect on Civilization", "Miracle of Feeding America"

5. Procedure:

   Background: Previous research of soil conditions and food productions followed by testing the soil nutrients and its possible productivity.

   a. Discuss what crops could be planted on the soil and divided into two or three groups. Each group will pick a crop and develop a chart to show growth.

   b. Review the procedure for planting a garden and what tools are going to be needed.

   c. Prepare and plant the garden. Take turns at maintenance about twenty minutes a day, twice a week.

   d. Show the film "Food Supply: Its Effect on Civilization", and discuss main points.

   e. Give the class a one week assignment to research various aspects of the population-food relationship.

   f. Show the film "Miracle of Feeding America".

   g. Harvest crop.

6. Discussion Questions:

   a. What are some other foods we eat besides what is in our garden?

   b. How long can we enjoy the fresh produce we are growing?

   c. How does this compare with our yearly intake of food?

   d. How much would we have to increase our crops to feed the entire town?

   e. How much garden space do we need for each crop?

   f. Why is it necessary to mass produce food in the U.S.?

g. Why are some people going hungry in America?

h. What can we do about this?

i. As the population increases, how does it affect our food supply?

j. What can we do about it as individuals?

k. Which do you prefer, growing your own food or buying it in the store?

l. Was our garden worth all the time and energy spent?

7. Resources:

a. "Food Supply: Its Effect on Civilization"(Journal, 1967)

b. "Miracle of Feeding America" (Swift, Sterling, 1955)

Upper Elementary

Talbert B. Spence

The Poor Pay More

1. Concept to be developed: Population.

2. Understanding to be developed: Human beings both produce and consume materials.

3. Time: 3 days.

4. Materials:

    a. Film: Poor Pay More: 60 min-looking at special hardships faced by the poor in the area of consumer purchasing.

    b. Chart paper and magic markers.

    c. Cameras

    d. Cassette tape recorder.

5. Procedure:

    a. Discuss with class prior to showing the film the issue of who controls the making of various kinds of products like:

        1. shoes
        2. homes
        3. food
        4. transportation
        5. electric power, etc.

    b. Have students form triads to come up with some ideas as to how people are persuaded to buy and sell all kinds of products. Have students record their ideas on chart paper and have each triad briefly explain the information they have developed.

    c. Have a group of students compile a list of all the natural resources used by man to produce the materials that the public consume. Have group place their list on chart paper for all to see. Discuss the terms renewable and non-renewable resources.

    d. Discuss how poor people in the cities and rural areas suffer special problems when it involves the purchasing of materials to consume. Show the film: Poor Pay More. 60 minutes.

    e. After viewing film have the class form into research teams to do an investigation of the consumer pricing in the school cafeteria and compare the pricing of items there with prices of the same items at the neighborhood store. Have teams report back their findings to the class.

f. Discuss the reasons why there are differences in prices on items from the cafeteria and the neighborhood stores.

g. Discuss how the population in the school has influence on the amount of food available in the cafeteria each day. Compare the number of people living in the neighborhood to the number of food chain stores, drug stores, corner markets, etc.

h. Ask students how do poor people survive the increase in price of consumable materials that are made available to them.

i. Have students interview store owners and community people: asking them the following: Have students take pictures and record interviews on tape.

1. How do you as a store owner determine the price of items in your store?

2. Are the prices in the neighborhood stores cheaper than those at the large food chain stores?

3. How much of your weekly income goes towards the purchasing of consumer goods?

4. What do you suggest as ways to fight the increase in demand and prices of consumer goods?

5. Does T.V. ads have any influence on what you buy?

6. Is your monthly income of a nature that will provide enough money to purchase good quality food and other consumer goods?

j. Have students compile data and present it to other classes in the school. Display different kinds of ads by having students make a large collage with magazine cutouts of consumer ads.

6. Discussion questions:

a. What are renewable and nonrenewable resources?
b. What does consumer mean?
c. What does poor mean?
d. How many students are there in the building?
e. How many people in your family?
f. Who buys the food in your house?
g. How much of your families income goes towards purchasing consumer products?
h. What does the term over-production mean?
i. What does the term under-production mean?
k. What does population mean?
l. What does conservation mean?
m. What does a neighborhood mean?
n. What does quality mean?

7. References: Poor Pay More, 60 minute, color N.E.T. Film Service Indiana University, Audio-visual Center, Bloomington, Indiana 47401. Poor Pay More - 60 minute, University of Michigan, Audio-visual center, Ann Arbor, Michigan.

Upper Elementary

Ruth Fox

NEEDS VS. WANTS

1. Concept to be developed: Population

2. Understanding to be developed: Human populations have different standards of living which produce different environmental consequences.

3. Time required for activity: Four class periods

4. Materials needed: Three dittoed charts for each child, pencils, chalk, chalkboard, encyclopedias, and extra dittoes.

5. Procedure:

   a. Hand out ditto #1. Instruct children to:

      1. (Individually) List the 5 most important possessions of your family and yourself. (10 minutes)

      2. (Individually) Number these in the order of importance to you. (5 minutes)

      3. (Small group) Make a list of possessions important to most of the group. (15 minutes)

      4. One member of each group copy results onto a single ditto to give to the class the next day.

      5. (Next day) Hand out ditto. Class, working in the same small groups, will look up and list the natural resources that went into one favorite possession of each member of the group. They might also look up whether these resources are available in the United States. (30 minutes)

   b. Hand out ditto #2 (could be on some sheet as #1) Instruct children to:

      1. (Working individually) List things you really must have in order to survive. (10 minutes)

      2. (In small groups) Consolidate your lists and try to group the items into three or four categories. One person in each group will write these down on paper. (15 minutes)

      3. (Whole class) One member of each group will write his categories and list on the board. The class will come up with "food, shelter, and clothing" or something similar. They can then write these categories at the top of ditto #2; they can complete the ditto. (5 minutes)

   c. (Next class period) Hand out ditto #3 and instruct class to fill in blanks and answer questions. (15 minutes)

   d. (Next class period) Discussion of meaning of findings for the individual and his feelings about the implications (One period)

Ditto #1:

List your important possessions.	List them again with the most important first	What natural resources are needed for the first three?
	1.	1:
	2.	
	3.	2:
	4.	
	5.	3:

Ditto #2:

List things you need to survive.	Categories they fall into:			
1.				
2.				
3.				
4.				
5.				
6.				
7.				

Ditto #3:

Copy your important possessions from ditto #1	Which could you give up		(Check one square for each item)	
	Completely	Twice a week?	Occasionally?	Never?
1.				

If you did the above, how would you feel?______________________________

(see next page)

If many people did, what difference would it make in your city? ______________

____

in your country? ________________________________

in a poor country? ______________________________

____

Based on what we have discussed, what possible decisions might you make? ______

____

____

____

Have you made any decisions? What are they? ______________________

____

____

Here is something additional which you might want to think about. It is one detail in a very large problem:

The United States contains about 6% of the world's people. We use close to 50% of the world's resources.

For example, each person in the United States uses about one ton (2000 pounds) of grain a year. In poor countries, many people individually use about 400 pounds of grain per year? Would these facts change your decision above?.......
Something to think about!!

Upper Elementary Mary Lou Hess

Who Needs What

1. Concept to be developed: Population.

2. Understanding to be developed: Human populations have different standards of living which produce different environmental consequences.

3. Time: 5 days - day 1 - movie
   day 2-3 - research and fill charts
   day 4-5 - discussion

4. Materials:

   movie "Had You Lived Then" (or another movie that depicts early American standards of living)
   wide-tip felt markers - 12
   charts headlined on large sheets of butcher paper (2 of each title)

TRANSPORTATION 1800 (or 1974)			
Ways	Power Used	Kind of road or route used	Environmental Effect
1. 2. 3.			

FARMING 1800 (or 1974)			
Acreage and crops	Tools	Power Sources	Environmental Effect
1. 2. 3.			

MANUFACTURING 1800 (or 1974)				
Products	Tools	Power Sources	Packaging & Advertising	Environmental Effect
1. 2. 3.				

AVERAGE HOME AND FURNISHINGS 1800 (or 1974)					
Size of House	Building Materials	Light & Heat	Amount & kind of Furniture	Appli-ances	Environ-mental Effect
1. 2. 3.					

PERSONAL POSSESSIONS 1800 (or 1974)				
Amt-kind Clothing	Appliances	Amt-kind Toys	Books	Environmental Effect
1. 2. 3.				

LEISURE TIME USE 1800 (or 1974)			
Hobbies	Entertainment	Education	Environmental Effect
1. 2. 3.			

5. Procedure:

   a. Show movie Had You Lived Then and discuss meaning of "standard of living" - (Population size had a great influence on the environment, too, of course. In 1800, U.S. had less than 10,000,000 people; in 1974 there were more than 200,000,000.)

   b. Divide class into 12 teams of 2 or 3 students. Give each of the first 6 teams one of the large charts for 1800 to research, discuss and fill in; the second 6 teams get the 1974 charts. All teams get marking pens.

   c. Each team will meet and talk over its topic using the movie input and library research to fill in its chart as completely as possible.

   d. Meet together and let the two teams who have the same topic present their charts and lead the discussion of the differences between the standards of living in 1800 and 1974, emphasizing the environmental effects.

6. Discussion Questions:

   a. In addition to the topics assigned to your teams, might health and medical care have had an effect on the standards of living in 1800 and 1974? Would this difference have an environmental effect?

   b. Are the sizes of families about the same now as in 1800? Can you think of any reasons for the differences?

   c. Is there a difference in the amount of waste materials connected with an improved standard of living?

   d. Can you suggest some ways we in 1974 may be able to fight back against the bad environmental effects of our good standard of living? What can you and your family do?

Upper Elementary

Kathy Page

The Price of Progress?

1. Concept to be developed: Population

2. Understanding to be developed: As human populations grow, it becomes more difficult to attain and maintain environmental quality.

3. Time: 1 day

4. Materials: the following cards

a. Profession cards:

mayor
doctor
housewife
grocery store owner
telephone company manager
high school teacher
local playboy
artist/writer
editor of local paper
service station operator
restaurant owner
electric/gas company manager
women's liberation leader

b. Hobbie cards:

skiing
fishing
car racing
hiking
bee keeping
simging
sleeping
reading
boating
astronomy
photography
swimming
people - watching
loafing
writing novels
violin playing

c. Health cards:

hay fever
no ailments
asthma
smoker's hack
heart murmur
overweight
arthritis
high blood pressure
hard of hearing

d. Attitude & Quirk cards:

loves animals
fears heights
ambitious for wealth
wants convenience
desires prestige
desires peace & beauty
loves people
is solitary
is a health nut
is optimistic
is pessimistic
believes in progress
distrusts progress
distrusts those over 30
loves to gamble
just moved from large city
hates taxes

5. Procedure:

   a. The class divides into small groups which randomly draws 1 profession card, 2 hobby cards, one health card and two attitude cards.

   b. A city/town is described to the students on the blackboard. Pertinent facts may include population size, unemployment, major industries, geography, general health, education, culture and entertainment. The scenario can vary with each game.

   c. The groups make decisions about situations 1,2 or another situation, arguing with the other groups that represent different interests.

      1. The ABC Container Company, largest manufacturer of boxes and cartons in the country, wants to build a $20 million plant 5 miles outside the city limits. Shall we support them?

      2. The state university wants to purchase 5,000 acres of shoreline north and east of the city limits as a conservation area. They will build 2 beaches and a large picnic/campground for public use, which will draw thousands of people from neighboring areas. Shall we oppose?

   d. Discuss the game and their reactions to it afterwards.

6. Discussion:

   a. Did everyone in the group work together?

   b. Did you get frustrated when others didn't have the same opinion you did? Can this happen in real situations?

   c. What were some of the problems that these situations posed for the city/town involved?

7. References:

   a. Environmental Quality Resource Kit (Middle School) Consumers Power Company. 1971.

Upper Elementary

Maria A. Simpson
Thelma Wurzelbacher

The Automobile

1. Concept to be developed: Population

2. Understanding to be developed: As human population grows, it becomes more difficult to attain and maintain environmental quality.

3. Time: One period with partners

4. Materials:

   a. Investigation sheet with data dump, graph and discussion questions
   b. 2 colored pencils
   c. Ruler, lead pencil, and scrap paper

Data Dump

Around the year 1900, U.S. population was 76 million and that same year, gasoline cars were just starting to be mass produced.
In the year 1950, there were 150 million people.
Population in the U.S. increased to 180 million in the year 1960 and 55 million cars were produced at that time.
205 million people and 80 million cars are in the U.S. today per 1970 census.
Population is expected to grow about 10% between 1970 and 1980.
Car ownership is expected to jump about 25% between 1970 and 1980.

(Above facts are written on cards to give to students)

5. Procedure:

   a. Each student chooses a partner. Partners receive data fact cards.

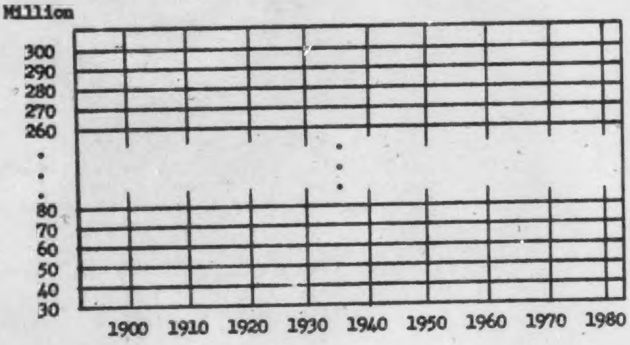
   b. Students discuss and analyze the data and try to define the problem. The problem is written on the board. Ex. Is there a relationship between increases in population and car ownership and environmental quality?

   c. Partners compute answers to the following on ditto sheet:

      (1). In 1900, how many cars were there in the U.S.? ____
      How many people were there? ________
      (2). In 1950, How many cars were there? ________
      What was the population? ________
      How many people were there for every car? ______
      (3). How many people were there in 1960? ________
      How many cars were there in 1960? ________
      How many persons per car is this? ________
      (4). What was the U.S. population in 1970? ________
      How many cars in 1970? ________
      How many cars per person were there then? ______

(5). How many people are expected in 1980? _______
How many expected cars in 1980? _________
How many cars per person will this be? ______
(Clue: To determine the above questions (#5) you will need to say to yourself, "If the population is expected to grow 10% by 1980, how much is 10% of the current population?" Therefore, 10% of ______ million people equals ____ people. The total population by 1980 would be ________.) Would you use the same process to find out how many more cars there will be in 1980?

d. Partners determine: For each of the years listed below, graph the number of people and cars. Use an O for cars and an X for people. Use different colored pencils.



6. Discussion Questions:

a. What message does the graph contain?
b. How many cars does your family have?
c. What are the consequences of the above two facts?
d. Have you ever experienced street congestion? Noise from cars? Exhaust fumes?
e. Why is the population increasing?
f. Do you think the U.S. should have all these cars? Why or why not?
g. Has the population and cars in the U.S. increased in the same way?
h. Make a list of the different ways the increased number of cars affect our environment?
i. List all the ways you can think of to change the effect of cars on our environment?
j. The car is only one thing which influences our environmental quality. Do you know of others?

7. References:

a. Options: A Study Guide to Population and the American Future, published by The Population Reference Bureau, Inc.; Library of Congress, 1973

Junior High

Ann P. Sibole

Cemetery Population Study

1. Concept to be developed: Population
2. Understanding to be developed: Population changes like births, deaths, growth rates and migration patterns affect individuals, their surroundings and society.
3. Time: 3 days - day 1 - field trip
   day 2 - compile data, draw graphs
   day 3 - discussion
4. Materials: Cemetery and access to it, preferably with dates of death before 1900.

   Data tables for each student:

Death Rates Within Specified Age Categories

		Age of Death										
		0-5	6-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	Over 90
Time Periods	1926-1974	no. %										
	1875-1925											
	1824-1874											

Chalk (for field trip)
Graph paper
Colored pencils or pens
Rulers

5. Procedure:

   a. Choose a cemetery that has dates of death prior to 1900 and is fairly large.

   b. Each student will make ten entries on his sheet (or that number which will give the class about 300 pieces of data).

   c. Students should make note of any information concerning cause of death.

   d. Students should not be biased in choosing or not choosing certain stones. Mark stones with a piece of chalk (small X) so other students know not to record the stone again.

   e. Back in classroom, compile data sheet on one master sheet by having students add their totals. This will give totals for each time period for each age range. Figure percentages.

   f. Ditto the master sheet so each student can have a copy, or every other student, at least.

   g. Students will graph each time period, using the age at time of death as the horizontal axis (i.e. 0-5, 6-10, etc.) and percent of sample in each age category (i.e. 0, 2, 4, etc.) as the vertical axis.

   h. Suggest using a different color for each time period (i.e. 1821-1870, etc.).

6. Discussion questions:

   a. Why do we have to change totals to percents in our data? What would totals do in the graph?

   b. Which age group experienced the largest decrease in deaths?

   c. How could you explain this decrease in each of the time periods?

   d. What factors may have influenced the reduction in the death rate of the 21-30 year old group in these time periods?

   e. What has happened to life expectancy (the average number of years a person is expected to live)?

   f. What two factors leading to greater population size are shown?

   g. Why might these data differ from city to country records data for the same time period?

h. From information provided, can you detect any significant migration patterns?

i. From the information provided can you make any inferences concerning the effect of people on their surroundings and society in general?

7. References:

a. Pollution, N.A.B.T. 1973. Human Life Table and Survivorship Curves: A Laboratory Study, Ken R. Marion.

b. Equilibrium (magazine). January 1974.

Junior High

Carolyn Kelley
William L. McKeand

SCHOOL POPULATION STUDY

1. Concept to be developed: Population

2. Understanding to be developed: Population changes like births, deaths, growth rates, and migration patterns affect individuals and their surroundings and society.

3. Time: 2 days - day 1 - compile school population and graph
   day 2 - discussion

4. Materials: School population figures, graph paper, pencils, pens, rulers.

5. Procedure:

   a. Give students the following school enrollment figures:
      1. Enrollment, Fall
      2. New students enrolled
      3. Students who have left since fall
      4. Present school enrollment

   b. If the actual figures don't show a significant difference to work with, you may wish to use hypothetical values.

   c. Have students graph the population figures on bar graph for ease of comparison and calculation.

   d. Refer to the graph whenever possible to help in answering the discussion questions.

6. Discussion Questions:

   a. What is the population increase due to new individuals entering the school (imigration)?

   b. What is the population decrease due to individuals leaving (emigration)?

   c. What is the growth rate? (found by comparing the number of students at the start of the school year to those at the close) What is this growth rate expressed as a percentage? (found by dividing the original enrollment into the total increase).

   d. What will your school's population be for each of the next five years?

   e. At the present growth rate, how long will it take your school's population to double? To double again? How do the doubling times compare?

   f. Assuming no physical change in the size or number of rooms in your school, what affect is the population of the next five years going to have on your school?

   g. What affect will increased or decreased migration rates, birth rates, or death rates have on your school?

7. References: People, Cook and Lecht, Columbia Books, 1968.

Junior High Harry Tindall

U.S. Population & Resource Use

1. Concept to be developed: Population

2. Understanding to be developed: The U.S. consumes a disproportionate amount of the earth's resources.

3. Time: 5 days - day 1 - Explanation of unit
   Review the making of a graph
   Hold up some political cartoons and discuss
   Assign jobs and groups
   Answer questions
   day 2 - Compile data, make graphs, cartoons, slogans
   day 3 - Present projects to class--discuss
   day 4 - Finish presentations. Panel discussion
   day 5 - Discussion

4. Materials: almanacs, atlases, graph paper, drawing paper, rulers, pens, colored pencils.

5. Procedure:

   a. Each student or group of students will select (or be assigned) one of the following projects:

      1. Construct a vertical bar graph, 8 1/2 x 11 in size, of any of the following:

         a. U.S. percent of population and U.S. percent of world energy
         b. Oil consumption of U.S. vs. the world
         c. Iron ore usage of U.S. vs the world
         d. Other graphs on whatever information is available to class--copper, bauxite, T.V. sets, radios, autos, meat consumption, paper, uranium, etc.

      2. Conduct a survey of the neighborhood. Each student survey five homes, gathering the following information:
         a. How many have four cars, three, two, one?
            How many have 6 T.V.'s, 5, 4, 3, 2, 1?
            How many have 6 or more radios, 5, 4, 3, 2, 1
            3 or more phones, 2, 1
            4 or more magazines or newspapers coming into the home, 3, 2, 1, 0
            3 or more phonographs, 2, 1
            As many as you have students for washers, dryers, dishwashers, air conditioners, toasters, hair dryers, etc.

         b. Compile data back in classroom
         c. Each student should take one subject, figure the

percentage and construct graph, e.g. 8% had four T.V.'s 12% had three, 40% two, 40% one.

- b. Present graphs to class with Discussion
- c. Make a cartoon to illustrate disproportionate U.S. share of resources that might appear in the foreign press. Display and discuss.
- d. Compose some slogans illustrating the same thing that might be scrawled on one of our embassy walls abroad--clever, appealing (Yankee Go Home[).
- e. Simulation. Upper level students. Three to five will act as visiting American students before the class who will be acting as students in a selected underdeveloped nation school. Like "Meet the Press", the class is polite, but critical. How many autos does your family have? How many televisions? Dishwashers, etc.? Can the panel defend their right to have all this?

6. Discussion questions:

- a. Do underdeveloped nations have a right to be outraged by our tremendous use of resources? Why?
- b. Is the U.S. overpopulated? Explain.
- c. Why has the U.S. been able to maintain its standard of living so high?
- d. Do the underdeveloped nations have a right to expect that they can achieve the same heights? Explain the consequences of such a universal increase.
- e. Is it likely that the rest of the world can ever match our present standard of living? Why or why not?
- f. Should we slow down our rate of technological advance? Are you willing to forego that new wall-sized, 3-D T.V.? What would be the economic consequences if we agree to stop buying new products? If we considered all our purchases?
- g. Based upon our high standard of living, how would you think our rate of pollution compares with other nations? Explain.
- h. What do you predict will happen in the near and the distant future regarding the use and abuse of natural resources?

7. References:

- a. The Complete Ecology Fact Book. Edited by Philip Nobile and John Deedy. Anchor Books, Doubleday & Company, Inc. Garden City, New York 1972.
- b. Are We Running Out of Fuel. Irving Bengolsdorf.

Junior High

Glen Erickson

Should the U. S. Always Get the Most?

1. Concept to be Developed: Population

2. Understanding to be Developed: The U. S. consumes a disproportionate amount of the earth's resources.

3. Time: 3-5 days

4. Materials: pencil, paper, poster board, library.

5. Procedure:

   a. Divide the class into groups of 2 or 3.

   b. Have each group decide on one country to research, making sure that the U. S. and other major developed countries along with developing countries are chosen.

   c. Have the class suggest sources of information on world resource consumption, such as:

      1. Library: encyclopedia, resource texts, etc.
      2. Magazines: National Wildlife, National Geographic, etc.
      3. Local environmental groups or Ecology Center.
      4. Newspaper.

   d. The groups, after selecting a country, should begin researching the resource consumption of their country, looking at:

      1. Types of resources consumed: major and minor ones.
      2. How the country obtains the resources they use.
      3. Amounts of resources used per year, and how this consumption relates to the total world consumption of these same resources.
      4. Types of resources that the country needs but has difficulty obtaining, and the reasons for this difficulty.

   e. Have the class include other items of information (other than the items above) they think of that relate to other countries; that are not specific to their selected country.

   f. After the groups have researched their countries, have the class compile their information in the form of a chart or model to illustrate the proportional consumption for each country of the total world resource consumption.

g. If possible, have the class determine how these proportions of resource consumption will change in the future. For example, developing nations will consume rapidly increasing amounts of certain resources (metals, minerals) as they become industrialized.

h. Play Baker's Dozen, found also in this booklet under Valuing.

6. Discussion Questions:

a. Are the countries which consume the majority of the earth's resources heavily industrialized, technological nations?

b. What proportion of the world's population is in the U. S., and what proportion of the resources consumed in the world are consumed by the U. S.? Why is there such a difference in these two proportions?

c. What percentage of certain items, like automobiles, televisions, radios, are used in the U. S. compared to the total world use of these items?

d. Suppose that only so many automobiles could be produced; and no more, should the U. S. get most of them because we already have the roads, expressways, and service stations that are necessary for cars, instead of developing countries which would have to build roads and stations for cars?

e. Is it right for the U. S. to consume such a disproportionate amount of the earth's resources? If not, what are some ways to change the situation?

f. What ways can you, as a member of the most affluent nation in the world, adjust your life style so that you consume less energy and less resources so that other people in the world might have higher standards of living?

Junior High

Pat Baron

Population of a Community

1. Concept to be developed: Population

2. Understanding to be developed: Populations have birth rates, death rates, growth rates, densities, immigation rates, emigration rates and age structures.

3. Time: 1 month - to collect data
   5 days - to compile and interpret data

4. Materials:

   a. Graph paper
   b. Blank map of the community
   c. Paper and pencil, colored pencils
   d. Ruler

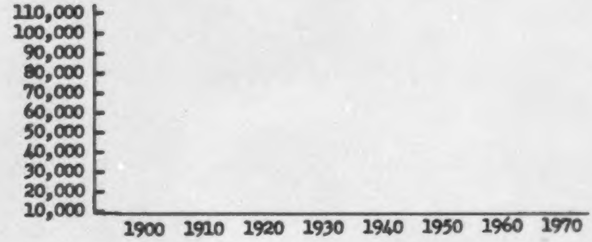
5. Procedure:

   a. One month before the actual compilation of data, have the students use the birth record and obituary sections of their local newspaper. For one month they should keep a record of births and deaths in the community.

   b. During this month also have the students contact real estate offices to determine how many people moved into and out of the community in the past year.

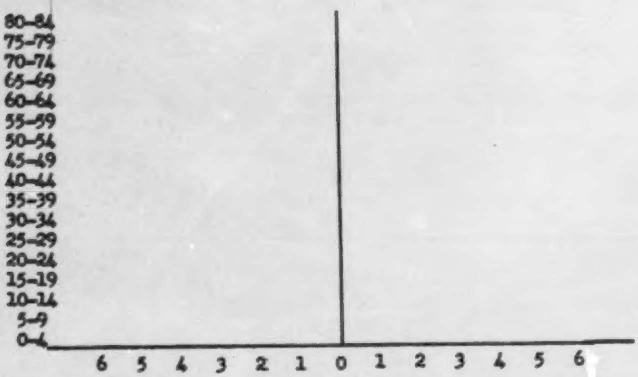
   c. Using the data on birth and death rates, graph the information on one sheet of graph paper using one color for births and another color for deaths.

   d. Using the census reports for your community, determine the population from 1900 to 1970 and graph the information using a bar graph.



   e. Using the latest census data determine the number of people per square mile in your community. On a blank map of the community and using a color code for varying population densities, fill in each square mile of the map.

f. Again using data from this latest census report, construct a population pyramid.



6. **Discussion Questions:**

   a. Why is one month too short a time to accurately measure birth and death rates?
   b. Why is one year an inaccurate time limit for measuring community immigration and emigration?
   c. At the present birth, death, immigration and emigration rates, will your community change much in the next ten years?
   d. Would you say that your community is a stable one? Explain.
   e. Are there specific times when more people enter and/or leave the community? Why?
   f. How has population density changed in your community?
   g. Why does your community have the density pattern that it does?
   h. How does the age structure of your community affect its economy, schools, recreational programs, police and fire departments, crime rate, stores, etc.?

7. **References:**

a. United States Census Reports

b. Ehrlich, Paul R. and Ehrlich, Anne W., Population Resources Environment, San Francisco, W.H. Freeman and Company, 1970.

Junior High

Glen Erickson

Drosophila: Population Dynamics

1. Concept to be developed: Population

2. Understanding to be developed: Populations have birth rates, death rates, growth rates, densities, immigration rates, emigration rates and age structures.

3. Time: 2-3 weeks

4. Materials: 3 jars (gallon, quart, pint), wide-mouthed funnels or plastic tubes (optional), ripe fruit (bananas, peaches, pears), pencils, paper, fine screen, or cheesecloth.

5. Procedure:

   a. Divide the class into 3 groups.

   b. Have each group grow their own population of fruit flies (Drosophila) in different sized jars.

   c. Place the peeled fruit in each jar. Place the jars outside for 2 days, with no covers. This will give adult fruit flies a chance to lay their eggs and establish a population in each jar.

   d. Bring the jars back into the classroom and cover the jars with cheesecloth (optional: immigration and emigration can be observed using the funnels or tubing and will be described later).

   e. Have each group design a chart to record their observations on each day, including the following items:

      (1) Number of adult males (smaller than females, with solid dark tip on abdomen).

      (2) Number of adult females (larger than males, with stripes all along abdomen).

      (3) Number of larvae.

      (4) Number of young, winged flies (not yet adults).

      (5) Number of dead flies.

   f. If immigration and emigration rates are to be studied, then place plastic tubing through the cheesecloth of the original population to antoher jar, which is just like the original jar, but with no population. Funnels could be used by placing the funnel in place of the cheesecloth, leaving jar outside and observing the incoming and departing flies from the jar.

(1) Immigration rates can be found by calculation. Immigration = (Total adult population on day 2) - (Adults from day 1 - deaths + estimated adults maturing from young, winged flies). For use with funnel apparatus.

(2) Emigration rates can be easily calculated using the two jar set-up by observing simply the number of adults populating the second jar.

g. After recording data for 2-3 weeks, have the students compile and analyze their data.

(1) Compile a graph showing birth rates per day, death rates per day, population size (total) per day, population size of adult females, and adult males per day.

(2) Compile another graph showing age structures by calculating the percent of the population that are adult males, adult females, young winged-immature flies, larvae, and eggs.

(3) Calculate population densities by dividing the total population figures (adults, immature flies, larvae, etc.) by the volume of the container.

(4) Growth rates can be found by calculating the percentage of the population added each day compared to the previous days totals minus any deaths.

h. Have the 3 groups compare their findings.

6. Discussion Questions:

a. Were growth rates the same for all 3 groups? If not, why?

b. What effect does the size of the container have on population growth and death rates?

c. Were the population densities different for each container?

d. Given enough time would all 3 populations reach approximately the same density? What factors determine the size of the population?

e. Were birth rates the same or different as the populations increased? Does available food and living space affect reproduction rates?

f. Do human populations increase in the same ways that Drosophila populations increase?

g. What factors control human population size?

h. What does "Malthusian population dynamics" mean (any biology text should explain Malthus' theories)? Does it apply to your experiment?

i. What happens to a population that is rapidly increasing and is confined to a limited space? In human populations, can you think of ways a population changes because it is becoming overcrowded?

Senior High

Glen Erickson

The Politics of Resource Consumption

1. Concept to be Developed: Population

2. Understanding to be Developed: As long as a few countries consume a disproportionate quantity of the earth's resources, while other countries need these resources, there will be political instability in the world.

3. Time: 1 week or more

4. Materials: Introductory remarks: International political instability results where a few countries (developed countries) are consuming the majority of the world's resources to increase their standard of living well beyond meeting their basic needs, while other countries (developing countries) are still trying to provide their people with adequate food, shelter, and medicine to live. In most cases, the developed nations have built their high standards of living by importing resources they wanted, but didn't have in their country from developing countries which had resources (aluminum ore, tin, lead, etc.), but were not industrialized enough to use them. The United States consumes almost 50% of the resources used in the world (37% of all the energy used), yet, has only 6% of the world's population (210 million of the total of 3.7 billion people in the world). Population experts estimate that our "spaceship earth" can support only 1/2 to 1 billion people at the North America standard of living without major technological breakthroughs in food production, energy production, and mineral extraction. More efficient utilization of the earth's resources, along with major recycling and reclaiming of resources would allow many more people in the world a standard of living comparable to that of North America. The problems arising from disproportionate resource consumption increases rapidly as the number of people consuming these limited, non-renewable resources increases, the world population grows 2% each year.

   a. ditto

   b. pencil, paper

   c. library

5. Procedure:

   a. Have the class discuss ways of finding out:

      1. Who consumes the earth's resources, and their amounts.
      2. Which countries have resources, and how they are being used.

3. Varying standards of living in developed and developing countries.
4. How the varying standards of living require different amounts of resources.
5. Key countries which disproportionate world resource consumption may be a political issue.
6. Key resource items, such as oil, which are presently or will become major, worldwide political issues.
7. Ways to avoid political instability caused by countries consuming much more of the world's resources than other countries (assuming these other countries desire more industrial growth and higher standards of living).

b. These are some of the topics that would be valuable to look at in understanding this concept. The students should be encouraged to think of other topics.

c. Possible information sources are:

   1. Encyclopedia
   2. Library
   3. Newspapers, radio, television
   4. Magazines (Atlantic, National Wildlife, Foreign Affairs, etc.)
   5. Local environmental groups

d. The topics decided upon to be researched can be divided among groups.

e. Also, each topic can be examined by having groups look at how different information sources (magazines, radio, etc.) consider the various topics. Most media sources have interests in supporting certain viewpoints about world topics.

f. After the groups have become informed about their chosen topic and media source, have the class discuss the topics from their varying viewpoints.

g. It would be helpful to have the class, or each group, make posters or charts showing resources used, resources exported, standards of living, etc. for their particular country, or topic.

h. Other viewpoints concerning world and societal resource use could also be examined, such as:

   1. Henry Thoreau's writings
   2. Mao Tse Tung's writings
   3. Findings from Human Environment Conference held in Stockholm in 1971.

i. These topics could form the basis for class debate, also.

6. **Discussion Questions:**

   a. How does your life-style differ from the life-style found in the countries your class examined?

   b. Do you see your standard of living increasing in the next ten years? In what ways might this increase be visible or recognizable?

   c. What common indicators of standard of living did you find (the class could list these indicators for all the countries examined to evaluate and compare the different standards of living in the world) among the countries?

   d. Does "standard of living" and "quality of life" mean the same? If not, how do these ideas differ?

   e. Why is the U. S. so interested in peace in the Middle East?

   f. Do developed countries, that became industrialized by utilizing resources from non-industrialized countries, have a responsibility to aid those countries when they want (if they do) to become industrialized also?

   g. When a population increases its standard of living well beyond meeting basic needs of the population, does the population "pay" for the increase in ways other than direct monetary ways? What are these ways?

   h. Is it right for any population to establish as high (or as consumptive) a standard of living as they can because any problems brought about by this standard are their own problems and do not affect other populations?

   i. The oceans are becoming a major source of food for the world's populations, but the larger developed nations are the only nations with the technology to harvest the sea on a large scale. These countries don't need the ocean's food as much as other less developed countries. How might the oceans be better utilized (and not exploited) to feed the people who need the oceans' food the most?

7. **Reference:**

"World EQ Index," National Wildlife Federation, 1412 16th N.W., Washington, D.C. 1973.

Senior High

Gary Bissell

POLITICAL STABILITY IN RESOURCE TRADE

1. Concept to be developed: Population

2. Understanding to be developed: As long as a few countries consume a disproportionate quantity of the earth's resources, while other countries need these resources, there will be political instability in the world.

3. Time: Approximately 30 to 45 minutes

4. Materials: Marbles and paper cups filled with Kool-Aid.

5. Procedure:

   a. Hypothetical countries are made up by dividing the class up into groups as is illustrated in the diagram.

   b. Each "country" has a certain amount of matches and marbles (or whatever) which symbolize natural resources (oil) or goods which are made from those resources. (Hint: Use Kool-Aid for fuel: will promote trade)

      Symbols: x = "citizens"   o = fuel x = military power derived
      . from available resources

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   c. The "countries"are told they may trade marbles for fuel with any or all of the other countries at any exchange rate they choose. They are to decide as a group what to do. They are not told what the marbles represent.

   d. After several trades, the teacher asks if anyone would like to share their feelings relative to the trades they made. (Valuing)

6. **Discussion Questions:**

   a. Why did you trade?

   b. How do you feel about the trades you made?

   c. Why did you trade with the "countries" you traded with?

   d. Why did you not trade with any particular country?

   e. Do you think trading is a stabilizing factor for the peoples of all countries concerned? Why?

   f. How do you feel about the sudden accumulation and excess consumption of the resources?

   g. Is this a stable situation? Why or why not?

   h. Which country do you think your group represented?

Senior High

Glen Erickson

Access To What We Need

1. Concept to be developed: Population.

2. Understanding to be developed: Different sectors of populations have varying degrees of access to the natural resources they need in order to survive.

3. Time: 3-4 class periods

4. Materials: Introductory remarks: Access to resources can be dependent upon physical (transportation) or monetary or racial constraints. Identifying the distribution of income in a community can tell a person a great deal about different person's access to a resource they need.

   a. Public library
   b. City clerk (optional)
   c. City Plan (optional)
   d. pencil and paper
   e. blackboard

5. Procedure:

   a. Divide the class into research groups of 5 or 6 to investigate the following:

      1) The income distribution of your community (or state or nation) obtainable from U.S. Census Bureau information in Public Library.
      2) The distribution of persons with the same general income in your community (where people with certain incomes live), obtainable from City Plan.
      3) Percentage of your community with access to an automobile, obtainable possibly from the City Clerk.
      4) Location of recreational areas in and around your city, along with regional or state recreational areas within a day's drive of your community, obtainable from Public Library or City Plan.
      5) Location of major shopping center complexes in and around your community also obtainable from City Plan.

   b. After the groups have researched their areas, have them compile their information on the board or on a chart:

      1). Draw a map of the city and region or state, placing on it the recreational areas and the major shopping complexes. Also include the general locations of persons with similar income levels in your community.
      2) List the income distribution on the board.
      3) List the percentage of people in your community with access to an automobile (if not obtainable you can use or adjust to your community the figure for most large cities in the U.S.; 42% of a major city's population does not have access to a car.

c. Based on the groups' pooled information have the class discuss the following discussion questions.

6. Discussion questions:

   a. What sectors of your community's population has the greatest and the least access to your major shopping complexes?

   b. What people have the greatest, and the least access to the local recreational facilities (think about the elderly, the young, minority groups, low income andhigh income groups)? What about access to regional and state recreational facilities?

   c. How does an elderly person unable to drive get to the grocery store? Where do you think this person would normally shop; nearby grocery store or distant shopping center chain store?

   d. Which stores have the highest and lowest prices, local independent grocery stores or chain stores? What sectors of the population have a choice where to shop?

   e. Are any local recreational facilities exclusive to certain income levels or racial groups? Which people are excluded?

   f. What sectors of a population have access to clean water, clean air? How do rural families get their water?

   g. Do sectors of population with easy access to essential resources tend to conserve or to waste their resources (think about people living in a desert climate)?

   h. What types of transportation are available to a person or family living in an inner city, with a limited income, and no access to a car? How How are this person's choices diminished concerning shopping, recreation, job?

   i. Huge amounts of money from taxes are spent in our population for highways Which sectors of the population are able to use the highways, and to what degree?

Senior High

Marge Gnau

The Hunger Gap

1. Concept to be developed: Population

2. Understanding to be developed: Different sectors of populations have varying degrees of access to natural resources they need to survive.

3. Time: 4 days - day 1 - Discuss concept; prepare your menu
   day 2 - Compare your intake to world intake and discuss
   day 3 - Film on Hunger and discuss.
   day 4 - Research deficiency diseases

4. Materials:
   a. World map of countries by name
   b. World map: The Geography of Hunger (fig. 4.4 Ehrlich)
   c. Daily per capita total protein, 43 countries (Fig. 4.5 Ehrlich)
   d. Daily per capita animal protein, (Fig. 4.5 Ehrlich)
   e. Basic food wheel
   f. Free Film from the Dairy Council, Inc. "FOOD FOR A MODERN WORLD" (22 minutes)

5. Procedure:

   a. Although some of our natural resources include oil, coal, natural gas, nuclear fuel, metal, wood, water and productive soil, the following lesson will highlight FOOD. Hopefully you could proceed with any of the above in like manner.

   b. List your individual daily intake of food.

      Breakfast:

      Lunch:

      Dinner:

   Compare this to the basic 7 requirements needed daily.

   c. Discuss the countries in the map and their protein intake. Relate the underdevelopment of the country to the malnourishment of the people.

   d. Collect pictures from magazines using the present Biafran situation as an example. Discuss not only the resulting starvation but also the political upheaval that resulted.

   e. Relate some of the deficiency diseases which are a result of starvation.
      1. Vitamin A. deficiency
      2. Beriberi
      3. Anemia
      4. Scurvy
      5. Pellagra
      6. Rickets

f. Prepare reports on these relating the vitamin deficiency to the resulting condition.

6. Discussion Questions:

a. Throughout human history the famines which have existed have generally been short-term events. How does the present hunger problem compare?

b. Some national and international organizations like WHO, FAO, UNESCO have been attempting to alleviate the problem of hunger. Collect some facts about what they are doing.

c. How would you feel about eating things like
    1. Yeast protein
    2. Soybean or algae hamburgers
    3. Fish protein concentrate

d. Do you think of such food as fake?

e. How do you react to vegetables and fruit that ripen in railroad cars or have coloring added to make them more attractive?

f. Have you ever eaten squirrel, rabbit or muskrat? Why or Why not?

g. The film Soylent Green portrays an unusual source of food. What was it? How do you feel about it?

h. What is it like to starve?

i. Do you think starvation affects the observer of the starving? Explain.

j. Do you feel any personal responsibility for this problem? Explain?

7. References:

Parson, Ruben. Conserving American Resources.
Prentice Hall, Inc., Englewood Cliffs, N.J. 1972.

Millard, Reed. Natural Resources.
Julian Messner, New York, 1973.

Ehrlich, Paul and Anne. Population Resources Environment.
W.H. Freeman and Co., San Francisco, CA. 1970

Senior High

Glen Erickson

Population Policies

1. Concept to be developed: Population

2. Understanding to be developed: Any position on human population policy has personal, social, ecological, political, and economic implications.

3. Time: 1-2 hours.

4. Materials: dittos, pencils.

5. Procedure:

   a. Prepare 3 dittos with 4 questions on each.

      (1) Group One:

         (a) Do you plan on having children someday? If so, how many (average for group)? How do you feel about adoption?

         (b) Consider the fact that China has over 3 times (750 million) as many people as the U.S. (200 million). How could the U.S. cope with 3 times its present population? How could our political system have to adjust or change to adequately function for the expanded population (think about what China has done)?

         (c) A prominent biochemist has stated that the earth can support only 1 billion people at the present standard of living in North America. The world population, as of 1970, was 3.6 billion. How long do you think you can have the present life-style you now have in the U.S., with so many other people desiring similar standards of living? What ways might we adjust our life-styles to keep our present quality of life (not the same as standard of living) for the future?

         (d) Do you feel population control is unfair to some people, in particular, minority groups? If so, in what ways, and who then should control their population? Is the U.S. right in trying to help developing countries control their population growth? Does the old phrase, "clean up your own backyard, first", apply to the U.S., when dealing with other nations?

      (2) Group Two:

         (a) Should all people have the freedom to have as many children as they want? What happens if everyone wants 10 children?

(b) How does the expanding world population (3.6 billion in 1970; 7 billion by 2000 at present growth rates) affect yourself now, and in the future?

(c) With the U.S. consuming 50% of the resources used in the world, how do you see developing countries reacting to the U.S. in the future? How does this imbalance lead to political instability in the world?

(d) If everyone continues to live just as they do today, what kind of world can your children look forward to? Will there always be "enough" to go around?

(3) Group Three:

(a) Are birth control policies morally right, only when decided by an individual? Is there such a thing as societal morality?

(b) Do you see human population as a central issue underlying other environmental problems? What is meant by population applying a magnifying effect upon environmental problems?

(c) Some people feel that wars, disease, and natural disasters will control population surplus. However, in five years of terrible war in Vietnam, the population on North and South Vietnam has grown more than 3 million. A giant tidal wave killed more than 500,000 people in East Pakistan in 1970, but this number was replaced in just 35 days. Have human populations gone beyond natural controls as we know them now? What kinds of future controls will the world population suffer if we continue to grow at the present rate (doubling every 30-35 years)? Remember, the world has only finite resources and population control will occur sometime, either by ourselves or in spite of ourselves.

(d) As population increase, family ties generally weaken. Old people used to be the most respected and most honored members of families, especially in populations such as the Japanese, and the Native Americans. But now the life of the aged is becoming very difficult, particularly if they don't have a healthy pension or savings. Is the current trend towards family disintegration inevitable as populations increase? Do the aged have the same rights to a quality environment as everyone else? How is the quality of life different today for the aged than for younger people in our population?

b. Divide the class into the 3 groups, and have them write answers to their questions (writing their responses can be omitted), followed by a group discussion of their questions. Some record should be kept in each group to list important points to remember for the class discussion.

c. After group discussions (anywhere from 20-60 minutes), bring the class together to discuss the 12 questions, sharing out each group's initial discussions.

6. Discussion Questions:

a. Was your class or group able to come to an agreement over any or all of the questions? If not, think about how difficult it is for governments to ever reach equitable or just decisions for their society.

b. Is it necessary for students your age to consider questions like in this activity? If it isn't, when will it be necessary?

c. If you were given 1 million dollars tomorrow (tax free), would you feel it necessary to consider questions like the ones in this activity, or would you feel right in doing as you please, not thinking about the world of tomorrow?

d. Do you feel population should not be considered in schools, for it is simply too personal?

7. Reference:

"The World EQ Index". National Wildlife Federation, 1412 16th St., NW, Washington, D.C. 1973.

Senior High **Joseph G. Konzer**

STUDY: MONETARY COST OF HAVING A CHILD

1. Concept to be developed: Population

2. Understanding to be developed: Any position on human population policy has personal, social, ecological, political and economic implications.

3. Time: Day 1 - Introduce and assign surveys
   One week later - Report on surveys and discuss

4. Materials:
   a. Survey to be answered by physician (gynecologist)
   b. Survey to be answered by hospital official
   c. Survey to be answered by recent parents (within 1 year)

5. Procedure:

   a. Discuss in class what makes people decide when to have a baby.
   b. Work toward the idea of economic decision - whether or not the parents can afford it.
   c. Then work toward the idea - How much does a baby cost? Let's find out.
   d. Assign someone to report on the estimated cost of raising a child today.
   e. Distribute the surveys (one each) to three volunteers to be filled ou and reported on in one week.
      1) Survey #1 - To be answered by a Physician (gynecologist)
      2 a. How much are your fees for pre-natal care? Total cost
        b. How much is your fee for delivery?
        c. Do you have any other fees that an expectant woman might have?
        d. Can you think of any other expenses that a pregnant woman would have? Other than through you?
      2) Survey #2 - To be Answered by a Hospital Official
        a. What is the cost for a semi-private room on the maternity ward?
        b. How long do mothers usually stay here?
        c. What other hospital expenses might occur during such a woman's stay? Please explain as to the amount and nature of expense.
        d. Can you add any expenses that an expectant woman would have, hospital or otherwise?
      3) Survey #3 - To be Answered by Recent Parents (Within 1 Year)
        a. What would you estimate as being the amount you spend on feeding your baby? Do you expect the amount to get higher as the baby gets older?
        b. About how much do you spend on your baby's clothes? Do you expect that to get higher?
        c. Did your insurances rates change as a result of your having a baby?
        d. What medical bills and hospital bills were not covered by your insurance? How much were they?
        e. Can you give an estimate as to how much you expect to spend on your child this year?
        f. Did you expect your child to cost so much?
   f. In one week collect the data and discuss the results.
   g. Lead into the idea that the decision of having a child is a very important economic issue for a family and society.

6. Discussion Questions:
    - a. What is the estimated cost of having a baby? Figure it out.
    - b. What is the estimated cost of raising a child to maturity?
    - c. Is it likely for the cost to raise a child to remain the same? What do you think will happen?
    - d. What happens if the woman works? What will happen to the money she's bringing in?
    - e. What happens if the child needs special medical help throughout his or her life?
    - f. Will the parents have as much money to spend on themselves after the baby is born than before? Is it important?
    - g. Should the mother return to work after having the baby? When? As soon as possible? Five years? Never?
    - h. Does the birth of a child in a family have economic implications within that family? Other implications - ecological, social or political?
    - i. What should a couple consider before deciding to have a baby?

CONCEPT

ECONOMICS & TECHNOLOGY

UNDERSTANDINGS:

A. Lower Elementary (Kdg., 1st and 2nd)

1. In our country, people are generally trained to perform certain types of work. Teachers, farmers, factory workers, conservationists, as well as other workers, all have special jobs to perform.

2. The food most people eat, clothes they wear and the homes they live in are paid for by the money they earn from doing their jobs.

3. Industries and business sell some things that people want and need: and encourage people to buy some things that factories have made, but people don't really need.

4. Not all people have enough money to buy all the things they need, want, or are encouraged to buy.

B. Middle Elementary (3rd and 4th)

1. The way people live their lives has an effect on how the earth's resources are used.

2. The way people live their lives has a direct effect upon the amount and type of industrial growth that takes place.

3. Businesses can create a demand for a product through the use of advertising.

C. Upper Elementary (5th and 6th)

1. The cost of producing a particular product includes such things as the resources used, wages of workers, advertising, taxes and improving working and environmental standards.

2. There are two kinds of costs associated with pollution: the cost of preventing pollution, and the cost of (or damage from) pollution once it occurs.

3. Some pollution costs cannot be put into dollars and cents.

D. Junior High (7th and 8th)

1. Usually, the costs (economic, resource and technological) of goods and services vary proportionately to societal demands for those goods and services.

2. Patterns and practices of using the earth's resources are largely determined by people's life styles, and the level of industrialization necessary to meet the demands of such life styles.

3. As the production of goods increases with demand, consumption of resources also increases.

4. Both supply and demand of a product influence the cost of the product.

E. Senior High (9th, 10th,11th and 12th)

1. Economic systems constitute the societal arrangements for producing and distributing the goods and services that individuals and societies desire.

2. Some businesses and industrial plants in the process of producing marketable products pass on social costs (i.e., air, water, and noise pollution) to society.

3. Satisfaction with the philosophy and functioning of the economic system is a major factor in the quality of life for individuals served by that economic system.

4. Each country has its own particular economic system, but all countries' economic systems are tied together through world markets of raw materials, food, and manufactured goods. Thus economic events that occur in one country affect other countries (i.e., crop failures).

5. Three major ecological trade-offs are (1) between population growth and environmental quality, (2) between levels of production and environmental quality, and (3) between the degree of urbanization and environmental quality.

Lower Elementary

Richard H. Wilhite

Pipe Cleaner Technology

1. Concept to be developed: Economics and Technology.

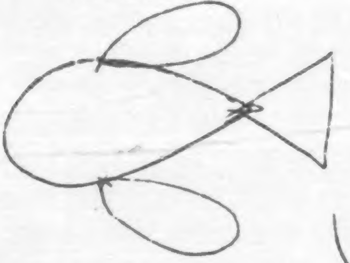
2. Understanding to be developed: In our country, people are generally trained to perform certain types of work. Teachers, farmers, factory workers, conservationists, as well as other workers, all have special jobs to perform.

3. Time: 30 minutes.

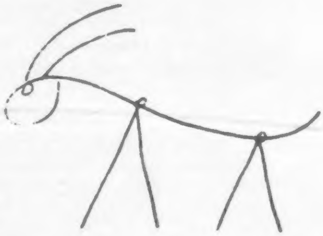
4. Materials:

   a. One package of pipe cleaners for each group (see 5a).

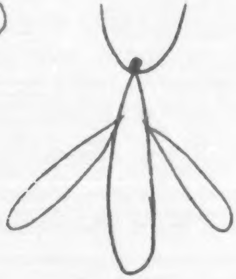
   b. A blackboard sketch of the pipe cleaner shape(s) to be constructed, such as the following:



FISH



LONG EARRED DOG



INSECT

Each shape requires that four pipe cleaners be twisted together to make the form, and these shown are about equally difficult.

5. **Procedure:**

   a. Divide the class into groups of five (left over children can be record keepers who will keep a running talley of the number of shapes made by each group over the construction period).

   b. Give a package of pipe cleaners to one member of each group - that member will keep the others in his group supplied.

   c. Assign construction jobs to the other four members of each group as follows: one head-body shaper, two body appendage shapers, one head appendage or tail fin (fish shape) shaper.

   d. Provide a sketch on the blackboard of the shape(s) the teams will be constructing, showing how the four pipe cleaners can be bent and twisted together to make the animal form. You may want to demonstrate how it's done. It's better to assign different shapes to different teams instead of having all teams doing the same thing at once.

   e. Construction proceeds like a relay race. The group supplier first gives a pipe cleaner to the head-body shaper. That group member bends his shape, gives it to the first "body appendage" man, who is then given a pipe cleaner by the supplier for his part, and so on until part by part, the animal form is constructed. At any one time, only one member of the group is working on his part. No helpers, please! When the animal form is completed, the group then starts over again.

   f. Over a 5 or 10 minute period, see which group can complete the most of their particular animals. Make a contest of it, and be sure to carefully notice behavior.

6. **Discussion Questions:**

   a. Which team made the most forms of their animal? Which team made the least?

   b. Did the "record keepers" (if any) notice why one team made more animals than another?

   c. Could any of the teams have made their animals look just right if the head, fins, ears, etc. were missing?

   d. Why was it important that each team member do his job well before passing it along to the next member?

   e. What would have happened if one team member didn't do anything at all with the pipe cleaner the "supplier" gave him?

   f. What would happen if everyone in the world had only one job to do - be a farmer, a teacher, a football player, etc.

   g. Ask the children to think of a cookie. How many jobs have to be done before someone can sit down at home and eat a cookie?

Early Elementary Patricia McKnight

Occupations Related to School Playgrounds

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: In our country, people are generally trained to perform certain types of work. Teachers, farmers, factory workers, conservationists, as well as other workers, all have special jobs to perform.

3. Time: 4 days - day 1 - Study of materials showing variety of developed playground sites, and if possible, visit to such a site.
   day 2 - field trip to own playground to discover preferences, problems, suggestions.
   day 3 - second field trip to observe older children, observe preferences, ask questions.
   day 4 - compile results, finish map showing results.
   Additional times needed for interviews of workers will depend upon choices and availability of subjects as discussed below.

4. Materials: Chart paper, construction paper, paints, crayons, felt tips, *books, slides (in references), available resource people (custodian, Dept. of Public Works representatives, landscape architect, nurserymen, parents, and others as indicated).

5. Procedure:
   a. Have children leaf through books, such as Lady Allen of Hurtwood, showing developed playgrounds, see slides, visit any nearby park sites to see what things they think make such places inviting and easy to use.

   b. Take first field trip to own school playground. Instruct them to think about:
      1) What they like to do most and where on the playground.
      2) What they like to do least and areas they dislike the most.
      3) What they do not like to see on the playground.
      4) What they would like to add.
      Children can draw pictures showing their answers. They also should draw a map of the playground showing general areas and equipment, circling in color their choices, checking areas needing improvement or to be eliminated. Summarize results with them.
   c. Next field trip to school playground when the older children are playing. Observations of older children's favorite activities and locations can then be added to the map in different colors. Observations should also show which areas are crowded, least used, how different groups come out of the school, go in, and what paths they use. (traffic patterns.)

   d. Day 4 - Make a list of chart paper of result. Discuss how the playground could be improved from all their observations (people, visits, books, etc.)

   e. Have them interview the custodian about his responsibilities, training, concerns. Have them think of how many ways they can help solve some of the playground problems indentified by working with him (walking on sidewalk instead of across plantins, sweeping gravel off asphalt, putting litter in trash cans, etc.)

f. Interview public works department representative regarding solid waste removal. What are their responsibilities? What do they do with the waste? What training do they need? What are their special problems?

g. Interview a landscape architect or a public works nurseryman about their work, training, ideas about public school recreation areas.

h. Interview city waste disposal officials and/or water treatment experts regarding waste disposal, their jobs, training problems.

i. Interview principal regarding his job, training, problems in regard to playground equipment, safety of children. Discuss their findings and suggestions with him. Before the interview, help children compile list of things they can do to assist in improving the playground. Encourage them to decide on a special project with an alternative that interests them. Discuss expert help they may need to accomplish project.

From here on, follow-up activities and project can involve many more kinds of expertise, which will help them gain an understanding of a variety of occupations, and the training involved.

j. Throughout the activities, whenever, parents expertise and experience can be utilized to demonstrate the concept of course it should be included.

6. Questions to be asked when interviewing workers.
   a. What kidd of work do you do?
   b. Is it indoors or out? Do you trame on your job?
   c. Do you use your hands and body a lot? Or is it mostly working with ideas?
   d. Do you work with people or mostly alone?
   e. What kidd of training do you need to do your job?
   f. What things did you learn in school that helped you with your work?
   g. What tools do you use?
   h. What hours do you work? Do you decide what these hours are?
   i. What do you like about your work? What do you dislike?
   j. What are the special problems you find in doing your work?
   k. Why did you choose this kind of work?
   l. What do you do for fun and to relax?

7. References:
   a. Ten Minute Field Trips by Helen Ross Russell, J.G. Ferguson Publishing Company, 1973, Chicago Illinois.

   b. Science in City and Suburb, staff of Current Science, American Education Publications Unit Book, 1969.

   c

Lower Elementary

Shellie M. Ellison
Patrick A. Miljour

Family Economics

1. Concept to be developed: Economics & Technology.

2. Understanding to be developed: The food most people eat, clothes they wear, and the homes they live in are paid for by money they earn from doing their jobs.

3. Time: 3 days - Day 1 - set-up, introduction.
   Day 2 - break children into groups to role play a family unit.
   Day 3 - actual role playing, discussion.

4. Materials: 3 Large packing boxes, poster paint, brushes, newspaper, masking tape, large store signs (Grocery, Clothing, Bank), money tokens, empty food cartons, paper bags, catalog pictures of clothing.

5. Procedure:
   a. Teacher will prepare the packing boxes to be used as stores (storefronts).
   b. Children will paint them.
   c. Teacher will assemble them, put on store signs, and stock stores, putting prices on items.
   d. Gather children around you and use first set of discussion questions.
   e. Break students into groups to role play a family unit consisting of 2 parents and 2-3 children.
   f. Children discuss in groups what their family needs to buy. (Remind them about making house or rent payments).
   g. Set up 3 children as storekeepers.
   h. Wage earners of family go to bank to receive salary. (For the first session all families will recieve the same income). ex: Factory worker will receive 10 tokens per family.
   i. Family groups go through stores and bank to make necessary payments and purchases. (Teacher will move around room seeing what children bought and giving necessary supervision).
   j. Get back into large group and use second set of discussion questions.
   k. Variations:
      1) Use varying professions with comparable pay scales.
      2) Vary the number of family members.
      3) Extend the concept by actually "selling" items at the store.

6. Discussion Questions:
   a. Day 2:
      1) Everyone needs food. Why?
      2) Everyone needs clothing. Why?
      3) Everyone needs shelter. Why?
         (homes)
      4) Where do you get these:
      5) How do you get them? (Pay for them)
      6) How do you get money to pay for these needs? (jobs)
      7) Do you think all jobs pay the same amount of money?
      8) What jobs do you think pay a lot of money? Not much money?

b. Day 3:
  1) Did everyone make payments for their homes?
  2) What kinds of food did you buy?
    a. meats
    b. milk
    c. fruits & vegetables
    d. bread
  3) What kind of clothes did you buy? (consider the season)
  4) Did you have enough money to buy the things you need?
  5) Did you have any money left over?
  6) If so, what could you do with it?
  7) How do most people get the food they eat, clothes they wear, and homes they live in?

Lower Elementary

Richard H. Willhite

Life and Work

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: The food most people eat, clothes they wear and homes they live in are paid for by the money they earn from doing their jobs.

3. Time: 60 minutes.

4. Materials:

    a. Introductory statement: Nobody could live very long without food to eat and shelter from the weather. There is a long chain of people between the food and shelter we need and the earth where these things come from. Each person in this chain works at jobs that help other people get the things they need or just want to have. Each person helps by working at his job. He trades his work for money which the other people give him for working, and he uses the money to buy things for himself. When we spend money, we are actually trading it for some kind of work which someone has done for us to get the things we need and want.

    b. Blackboard and chalk.

    c. Colored construction paper and scissors for each student.

    d. One large sheet of poster paper.

    e. Cellophane tape.

5. Procedure:

    a. Present introductory statement.

    b. Tape the poster paper to black board.

    c. Have each student divide his construction paper in half, trace a human figure on each half, and cut the figures out. These will represent workers and buyers in the chain from food consumption to food production.

    d. Ask class members to name one of the foods they ate at their last meal, and list these on the blackboard.

    e. From this list, select one food mentioned three or more times.

f. On the right-hand end of the poster, tape a paper human figure to represent the person who ate the food selected.

g. From there, ask the students to think of who sold them (their parents) the food. The student who names "grocer can place one of his paper figures to the left of the consumer on the poster. Label that figure "grocer".

h. Soon, someone will mention "farmer" and that paper figure can be linked to the left of the previous figure. The figures may have to be shifted around as more and more "middle men" are though of.

i. Ask leading questions to help the chain grow:

  1. Who helps the farmer get the food he grows to the grocery stores we buy it from (truck driver, field laborers, whole-saler, etc.)?

  2. Who helps the store owner get the food ready for you to buy (baker, canner, butcher, dairymen, bottler, more truck drivers, etc.)?

  3. Who does the store owner pay to keep his store running (stockboy, cashier, janitor, meat packer, etc.)?

  4. Who pays your parents so that they can buy the food?

j. Stop the chain's growth when the poster gets too crowded, or when the students finally run out of answers (not likely).

k. Try other kinds of "producer-consumer" chains (such as houses, clothes, cars, televisions, etc.).

6. Discussion questions:

  a. When someone goes to the grocery store, are they paying for just the food alone?

  b. How do people in the middle of the chain pay for the food they need?

  c. Does the farmer have to pay anyone for the food he needs?

  d. Why do people go to work?

  e. Do (other) animals have to work to get the food and shelter they need? What kinds of food do animals eat?

  f. What are some other things besides food that people work for so they can buy them? Are there some things that are free?

  g. Think of other things you use at home. Would some chains be shorter than others, between the person who makes something and the person who finally uses it?

Lower Elementary

Richard H. Willhite

Business, Needs, and Desires

1. Concept to be developed: Economics and Technology
2. Understanding to be developed: Industries and business sell some things that people want and need: and encourage people to buy some things that factories have made, but people don't really need.
3. Time: 60 minutes.
4. Materials:
    a. Two large sheets of poster paper.
    b. Old magazines (womens', travel, hobby, news, etc.).
    c. Scissors for each student.
    d. Cellophane tape.
5. Procedure:
    a. Tape the sheets of poster paper on opposite sides of the room or at opposite ends of the blackboard.

    b. Place the magazines at a central location in the room.

    c. Ask the students to imagine themselves as adults. Explain that on one sheet of poster paper they will tape pictures cut from the magazines which show things that they would like to have if they could as adults.

    d. Explain to the students that on the second sheet of poster paper they will tape pictures which show things that they will have to have as adults in order to live.

    e. Allow the students time to look through the magazines and make their choices, so that two collages are formed: perceived actual needs on the one hand and perceived desires for adulthood on the other.
6. Discussion Questions:
    a. Do the two posters show similar pictures?

    b. Why do you feel you need those things on the "needs" poster?

    c. If you could really do without those things on the other poster, why did you choose them?

    d. Does everyone agree about the things they would need to have in order to live? Why or why not?

e. Are there some pictures on one poster that could be put on the other poster? Why or why not?

f. If you had to make a choice of five "needed" things, which five things would you choose?

g. Which of the things on the "want to have if you could" poster use electricity?

h. Electricity in peoples' homes has only been common for about the last 70 years. Which things on both posters could only work if your home had electricity?

i. If you couldn't get electricity, could you still live without the things you chose?

j. How did you first find out about the things you chose (parents, friends, T.V., etc.)

k. How do other people in the world survive without the "need" things you chose?

l. Ask your parents to give you the names of five things they'd like to have but don't have now.

m. Why don't they have those things?

n. Why do businesses tell people about things that they don't have money enough to buy?

o. Why do businesses try to sell people things that they don't need to live?

p. Is it fair to try to sell people things that they don't need to buy? Why or why not?

Lower Elementary

S. Buffone
D. Schoolmaster

Choices Within a Token Economy

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Not all people have enough money to buy all the things they need, want, or are encouraged to buy.

3. Time: I day -- initial discussion.
   running economy concurrent with other daily activities.
   concluding discussion.

   The activity could be carried on for several days.

4. Materials:
   a. Token "money".
   b. Tasks to perform, each assigned a token value.
   c. Goods and services to purchase, each assigned a token value. (These choices should range from essential classroom needs to things that would be equivalent to absolute "luxuries.")

5. Procedure:

   a. Set compensation rate for performing specific jobs and assignments for the day. (See reference section.)

   b. Set "prices" on goods and services in the classroom. There should be goods and services available that fall into three categories: (See reference section.)
      1. Essentials: desk space, pencils, paper, etc.
      2. Needs, but not absolute basics: going to the library, etc.
      3. "Luxuries". Available candy, unique games, toys, "paying" someone else to put away paint.

   c. The teacher must attempt to "advertise" and make some of the items very appealing, especially those that do not fall into the "need" category. (See reference section.)

   d. The compensation for the jobs and assignments and the amount needed for purchasing wants and needs must be set in such a way that almost every child would have to set some priorities and make some decisions.

   e. The token economy can then be run for any desired amount of time and can run concurrent with other curricular areas.

6. Discussion Questions:

   a. How did we earn the tokens?

   b. Did everyone have the same number of tokens?

   c. Could everyone buy all the available goods and services?

d. Could everyone purchase the same number of things?

e. Did everyone have to make some choices?

f. How did you choose?

f. Did something make choosing harder? Where some items harder to *not* choose than others?

7. References:

a. Compensation for tasks might be set as follows:

1. Math page: 3 tokens (all correct: 2 additilnal tokens.)
2. Handwriting: 4 tokens.
3. Art activity: 3 tokens.
4. Reading: 5 tokens.
5. Reporting to group: 3 tokens.

Thus, the more efficiently a student is able to work the more he will earn. Tokens could also be offered for helping another child, participating in a group discussion, etc.

b. Items can be priced in the following manner:

1. Desk space: 1 token.
2. One pencil and 2 pieces of paper: 1 token.
3. Drink of water: 1 token.
4. Library for 15 minutes: 3 tokens
5. Candy bar: 3 tokens.
6. Checkers: 3 tokens

Any material or activity or choice that is part of your regular classroom operation can be put into this economy.

c. The "advertising" done by the teacher should attempt to simulate the kind that urges people to make purchases: signs; commenting about how good the candy is; how much the children will enjoy the new game; mentioning all the new books and magazines that are in the library; saying how much easier it is when you have someone else wash the paint brushes for you.

Lower Elementary

Richard H. Willhite

Rich and Poor

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Not all people have enough money to buy all the things they need, want, or are encouraged to buy.

3. Time: 60 minutes

4. Materials:

   a. Bag of cookies, with enough for each student to have only one cookie.
   b. Flat tray to hold the cookies.
   c. Box of flat toothpicks.
   d. Empty milk carton.
   e. Shoebox or similar-sized container.
   f. Crayon or pencil for each student.
   g. Scissors, one pair only or one pair for each student according to grade level (see below).

5. Procedure:

   a. Have the students cut out equal-sized slips of paper such as can be used for a random name drawing.

   b. Have each student write his or her name on his slip of paper.

   c. Place all the names in the shoebox, and hold a drawing.

   d. The first name drawn receives three toothpicks from the teacher. The second name drawn receives one toothpick, the third name three, the fourth one, and so on in an alternating 3 - 1, 3 - 1 pattern until one-half of the class holds three toothpicks apiece and the other half receives only one apiece.

   e. Dump the cookies onto the tray.

   f. Place the milk carton near the tray.

   g. Explain to the students that they can now use their toothpicks as money to buy cookies. They pay for cookies by going up to the tray and dropping their toothpicks into the milk carton. Cookies cost one toothpick apiece.

   h. Hold another name drawing to determine who goes up first, second, third, etc.

i. Allow the students one at a time to buy cookies until the pile is exhausted. In the end, some students will have three cookies, some will only have one, and the rest will have none at all.

j. Give them a few minutes to eat their cookies and freely discuss their feelings with one another.

6. Discussion Questions:

a. How did it feel to be someone able to buy three cookies?

b. How did it feel to have only one?

c. How did you feel if you got left out completely?

d. If you got left out, or only got one cookie, did you feel cheated? Why?

e. If you got three cookies, did you feel better than the others who got less? Why or why not?

f. How do people usually get the money they need to pay for things with?

g. Why do some people get more money than others?

h. Are all jobs just as hard to do?

i. How would you feel if you needed $100 to buy medicine for your family, and your job only paid $25?

j. Does everybody have enough money to buy the food, clothes, and medicine they need to stay healthy? Why or why not?

k. What do poor people do when they can't get enough money to buy the things their families need and want?

l. What would it be like to never have enough food to eat?

m. Most of the people in the world are poor. Why is this?

Elementary Maryanna Baldwin

Energy Use Study

1. Concept to be developed: Economics and Technology.

2. Understanding to be developed: The way people live their lives has an effect on how the earth's resources are used.

3. Time: 5 days - day 1 - Bake cake
   day 2-3 - Take home survey worksheets
   day 4 - Share results of survey
   day 5 - Discussion questions

4. Materials:

   Boxed Cake mix (any kind)
   Wooden mixing spoon
   Portable electric mixer
   Bowl
   Cake pan
   Access to oven in school
   Worksheet: (1 copy per student)

The Helpers We Have Today

Directions: Look at the list below. Put a check mark by the ones which you have in your home now. Ask your parents if they used this appliance when they were your age (approx. yr. 1945). Then ask your grandparents (or someone about their age), if they had this appliance in their home (approx. yr. 1915).

Appliance	1915	1945	Now
1. Refrigerator			
2. Central heating			
3. TV set			
4. Power mower			
5. Vacuum cleaner			
6. Clothes dryer			
7. Automatic washer			
8. Hot water tank			
9. Electric hair dryer			
10. Freezer			
11. Electric or gas range			
12. Electric fan			
13. Air conditioner			
14. Toaster			
15. Electric frying pan			
16. Car air conditioner			
17. Electric dishwasher			
18. Blender			
19. Electric toothbrush			

Appliance	1915	1945	Now
20. Garbage disposal			
21. Electric blanket			
22. Phonograph			
23. Electric razor			
24. Electric trimmers			
25. Electric garage door opener			
26. Radio			
27. Electric mixer			
28. Electric knife			

5. Procedure:

   a. To introduce the concept of energy, prepare with the class, a boxed cake mix, applying both hand mixing and electric beating techniques.

   b. Discuss how energy was involved in mixing the cake.

   c. Bake the cake.

   d. Discuss sources of energy (ex.: human, wood, gas, oil, falling water, electricity).

   e. Distribute worksheet (see Materials), and have students take home to make survey. Note: For 1915 column, encourage students to talk to the oldest person they know, if their own grandparents are not available.

   f. Return work sheet to class - compile data on board, with number of checks for each appliance, under each period of time.

6. Discussion questions:

   a. During which period of time did you make the greatest number of check marks?

   b. Were you able to find out anything about what life was like for your grandparents (or oldest person you contacted), in regard to: how they traveled; to what extent gas or electric appliances were used; how food was cooked; how the washing was done; how the home was heated?

   c. What do the answers to the above question tell you about how much energy we are using today?

   d. Are there any electrical appliances on this list which you feel your family could do without?

   e. What are some of the ways in which you could help in conserving energy?

   f. Are there some ways in which we could save energy use in our school?

7. References:

   a. Folker, The Energy Crisis (What you can do about it), Standard Oil Co. (Indiana), 1973.

Middle Elementary

Richard H. Willhite

Housing and Resource-Consumption Study

1. Concept to be developed: Economics and Technology.

2. Understanding to be developed: The way people live their lives has an effect on how the earth's resources are used.

3. Time: 2 days - day 1 - compile research
   day 2 - comparison of research, discussion.

4. Materials:
   a. Access to a building under construction, if possible.
   b. Yellow Pages of telephone directory.
   c. Donated time from a construction engineer to speak before the class on day 2. (optional)

5. Procedure:

   a. Assign two or three class members the task of visiting a nearby building or house currently under construction, for the purpose of gathering small samples of modern construction materials (wood, concrete, strip of wire, etc.). Permission of parents and contractor will have to be obtained.

   b. Divide the rest of the class in half. One half will do elementary research on the construction of 19th century Plains Indian teepees, with special attention to materials used, sources of materials, and how materials were obtained.

   c. The remaining half will make a "construction materials home work survey" of their own homes, listing as many kinds of raw materials as they can find. While doing this, they should make guesses as to the sources of those materials. (where did the lumber, plumbing metals, floor-tile materials etc. come from?) They should have these lists with them when they return to school on the following day.

   d. If possible, contact by telephone a construction contractor, and ask whether or not an engineer might be willing to speak to the class about the geographic sources of raw materials for modern construction, how they are processed for use, and how they are transported to the building site. The engineer can also explain how a building site is prepared, and how actual construction proceeds.

e. Assume that a modern building is being constructed in your town. With the help of the engineer, locate the sources of raw building materials on a map of the world, and connect those locations to your town with string.

f. Now, assume that a 19th century Plains Indian is building a teepee in southern North Dakota of 100 years ago. Do the same raw-material source-location with respect to the Indian's environment and his construction needs.

g. Have the children make a table to compare the two kinds of housing on the basis of kinds of materials used, place obtained from (in the raw state), means of obtaining the raw materials, relative amount of human and non-human energy, expended in obtaining them, relative amounts of living versus non-living raw materials used.

6. Discussion Questions:

a. Which type of house would be more difficult to build? Why?

b. What happened to the natural resources which the Plains Indians used to build their houses?

c. Which type of house takes the most work to build? Work by humans? Work by machines?

d. What will happen to modern construction if the raw materials cannot be transported easily to the building site?

e. What would happen to a modern builder if he could no longer obtain an important material, such as copper (wiring, plumbing, etc.)?

Middle Elementary

Marion Maitland
Montel Ruble

Interrelationships of Waste and Demand

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: The way people live their lives has a direct effect upon the amount and type of industrial growth that takes place.

3. Time: One week - day 1 - field trip and classification project
   day 2 - collect throw-aways in classroom
   day 3 - collect throw-aways from home
   day 4 - compile data, tally on chart
   day 5 - discussion

4. Materials: 6 paper bags for group work, 1 paper grocery bag for each student, data table for each student.

Papers	Plastics	Aluminum

5. Procedure: a. Take a walk around the school yard and collect throw-aways put them in a bag to be taken back to the classroom.

   b. The students are divided into 6 groups when they get back to the classroom. In their small groups they will decide together to:
      1). Divide the throw-aways into two piles.
      2) Classify the throw-aways into two groups as to their usefullness and unusefullness.

   c. The students will collect all their classroom throw-aways for three days and put them into a large grocery bag.

   d. The students will collect as many throw-aways that they can from home and put them in their bag.

   e. Ditto the master sheet so each student can have a copy.

   f. Students will tally on their chart the number and kinds of throw-aways they have collected during the weeks time.

   g. Provide a space on the chalkboard or large chart in front of the room to tally the total classrooms findings.

6. Discussion Questions:

   a. What kinds of things have been used and thrown away?

   b. What kinds of things have been used most and thrown away by the whole class? Look on large room chart.
      1) Discuss data from room chart.

   c. How could their families use less throw-aways?

   d. How could their families use less throw-aways?

   e. What might happen if less of these materials were used?

   f. Discuss what is in their family life styles as to why they used more of one kind than another.

   g. From the information provided, can they make an inferences concerning the amounts they use and what it might determine as to an increase or decrease in production of such products?

   h. Bring out the fact that decrease production could cause unemployment for people.

7. References:

   a. Habits and Habitats, My Weekly Reader, Book B. Education Center, Columbus, Ohio.

Middle Elementary

Marilyn Masouredis

Family Electrical Usage Study

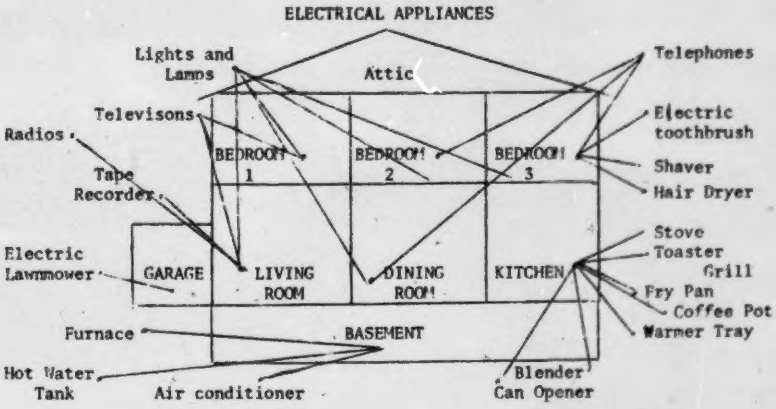
1. Concept to be developed: Economics and Technology.

2. Understanding to be developed: The way people live their lives has a direct effect upon the amount and type of industrial growth that takes place.

3. Time: 7 days - day 1 - Introduce unit
   day 2 - field trip
   day 3 - visitation
   day 4 - films and filmstrips
   day 5 - assemble bulletin board
   day 6 - compile data
   day 7 - discussion

4. Materials: Access to a local electric company.
   Promotional unit by the local telephone company.
   Films and filmstrips depicting a non-industrial society
   Bulletin board depicting the cross section of a house and the appliances within:

Bulletin Board (Suggestion)*


ELECTRICAL APPLIANCES
Lights and Lamps
Attic
Telephones
Televisons
Electric toothbrush
Radios
BEDROOM 1
BEDROOM 2
BEDROOM 3
Shaver
Tape Recorder
Hair Dryer
Stove
Toaster
Grill
Electric Lawnmower
GARAGE
LIVING ROOM
DINING ROOM
KITCHEN
Fry Pan
Coffee Pot
Furnace
BASEMENT
Warmer Tray
Hot Water Tank
Air conditioner
Blender
Can Opener

*Use ribbon or string for connectors.
Use words and/or pictures for electrical items.
Use construction paper for the house.
Use electrical cords for the title of the bulletin board. The letters can be pinned into shape.

4. Materials (Continued)

Individual data sheets for electrical item inventory:

Electrical Items in My Home

Clocks	Fans	Lights and Lamps	Radios	Television	Tape Recorders
Electric Toothbrush	Electric knife	Electric Shaver	Electric Hair Dryer	Stove	Toaster
Grill	Waffle Iron	Fry Pan	Coffee Pot	Warmer Trays	Bun Warmer
Blender	Mixer	Furnace	Hot Water Tank	Air Condi-tioner	Electric Lawnmower
Electric Edger	Electric Trimmer	Telephone	Can Opener	Power Equipment	Other

Key: 1 = one for each item of that type in the home

Total number of electrical items in my home:__________

5. Procedure:

a. Introduce the unit by pointing out the items in the room and school that require electricity.

b. Take a field trip to the local electric company. Have the children keep track of the number of factories and warehouses along the way.

c. The Michigan Bell Telephone Company has an excellent promotional package that includes films, film strips, telephones, and visitation by a telephone person with his truck and gear.

d. Show films depicting non-industrial people like the aborigines of Australia or the Eskimos of Alaska.

e. Have the entire class build the bulletin board. Only the cross section of the house and garage with the rooms labled, should be done ahead of time. As the children name the possible electrical items found in a home, pre-cut paper strips can be labled with felt pen and pinned to the board along with the connecting strings showing the number of appliances of that type and their possible location in the house.

f. Have each youngster take home and fill out an Electrical Items data sheet. Anything that requires electricity is to be shown on the sheet.

g. To correlate this unit with math, each child in a row can submit his total number of electrical items. This would give us about six reasonable renaming problems in addition. Then the total of each row will make up the final and more difficult addition problem. The answer will be the total number of electrical appliances used in the homes of the whole class. This lesson can be done at the chalk board.

6. Discussion Questions:

a. Compared to the people we saw in the film, do we use a lot of electricity? How do you know we use a lot of electricity?

b. How do our surroundings differ from the surroundings shown in the film? How do we differ from the people in the film?

c. How do our homes, clothing, food, communication, transportation etc., compare with what we saw in the film?

d. Could we live the way we do without electricity?

e. What would our lives be like without electricity?

f. What would our surroundings be like without electricity?

Middle Elementary

Richard H. Willhite

Advertising and Product Demand

1. Concept to be developed: Economics and Technology.
2. Understanding to be developed: Businesses can create a demand for a product through the use of advertising.
3. Time: 60 minutes.
4. Materials:
    a. Old newspapers and magazines (women's, men's, hobby, travel, fashion, news, etc.).
    b. Several large sheets of poster paper.
    c. Paste.
    d. Scissors for each child.
5. Procedure:
    a. Have the students look through the magazines to find advertisements for products that they would like to own, now or as adults.
    b. The students should cut the ads out and make collages by pasting them on the poster paper.
    c. Have them make a list of ten products they would like to own whether shown in one of the ads or not.
6. Discussion questions:
    a. Ask students to explain the reasons for choosing certain advertisements: What was it about the advertisement that suggested that the product would be good to own?
    b. Look at an advertisement someone else chose. What do you think it is about the ad that made the other person choose it?
    c. Find an advertisement for cigarettes. What else is shown in the ad besides the product itself?
    d. What are some extra things shown in the other ads?
    e. Why do advertising men show those other things if all you can really buy is the product itself?

f. Do any of the ads show the product as it is being made? Why or why not?

g. Do any of the ads tell you about problems associated with the product (auto wrecks, injuries to the user, high energy consumption, etc.)? Why or why not?

h. Does any ad show the product when it is old and worn out? Why or why not?

i. The writing on pencils, lightbulbs and some manhole covers is advertising, too. Do these ads make you want to rush out and buy a pencil or a manhole cover?

j. How are those ads different from those in the magazines?

k. Which of those items on your lists did you first hear about from someone you know?

l. Which ones did you read about? Mark these with a book shape.

m. Which did you see advertised on television? Mark these with a box shape.

n. Which ones did you first hear about on the radio? Mark these with a rectangle.

o. Does advertising play a large or a small role in helping you decide what to buy?

p. Who pays for advertisements?

Middle Elementary

Karen Kline

Advertising

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Businesses can create a demand for a product through the use of advertising.

3. Time: 1-2 weeks

4. Materials:

    a. Any available art materials to be used for purposes of advertising (paints, crayons, scissors, rulers, construction paper, glue, poster board, etc.)
    b. Dittos and ditto paper for handbills
    c. Stage and costumes for TV ads
    d. The needs for materials are flexible and depends on the materials available to you in your situation.

5. Procedure:

    a. Divide your class into two groups who will work as competitive teams.

    b. The two groups should each be given a box (plain and unadorned and exact same sizes). The class should then agree to its fictional contents. Ex.- cookies, crackers, popcorn, cereal, etc.

    c. Each group can advertise their product to the school in any form:

        (1). Designing a package cover and displaying (include name of product and picture).
        (2). Putting up posters in the school.
        (3). Mock TV advertisements to be presented before school.
        (4). Newspaper ads for school newspaper.
        (5). Salesmanship pitches which may be presented to different classes.
        (6). Mock radio advertisements which could be presented over an intercom system.
        (7). Handbills written up on dittos.
        (8). Set up contests using proposed labels as requirements to enter the contest.

    d. Advertise for one to two weeks depending on your program.

    e. Send a secret ballot vote around the school and have each child vote on which product he would buy as a result of advertising.

    f. Tabulate the results of the vote.

    g. Conduct a debriefing session after the results are known.

6. Discussion Questions:

   a. Perform a class secret ballot vote to see if results conform to the school decision.

   b. Which form of advertising did each opposing group excel or do best in? Why was it better? (color schemes? design? descriptive words? appeal to the age groups? etc.)

   c. Were there any familiar products which you copied ideas from?

   d. Did success depend on time expenditure?

   e. Did success depend on material expenditure (cost)?

   f. Can you think of a product you were interested in by advertising but when you tried it, you didn't like it?

   g. Can you give any suggestions of some helpful critism to your fellow team on their advertising?

   h. Do you feel the school vote results would have been the same if there had been no advertising and only two products were given as follows:

      Product A
      Product B

   i. Do you think you would like advertising as a career?

Upper Elementary

Darrell Donelson

Classroom Newspaper

1. Concept to be developed: Economics and Technology.

2. Understanding to be developed: The cost of producing a particular product includes such things as the resources used, wages of workers, advertising, taxes and improving working and environmental standards.

3. Time: 10 days -- day 1 - discussion of planned field trip and what to look for.
   day 2 - field trip
   day 3 - discussion, compile data, break into groups
   day 4 - 7 - work in particular area
   day 8 - Publish and sell paper
   day 9 - compile data, draw graphs
   day 10 - make conclusions, discuss comparisons to regular newspaper and how to improve ours.

4. Materials: Newspaper plant and access to it. Special emphasis on resources used, wages, advertising, etc. (City-county-local trade union-high school newspapers are possibilities)
   Note pads
   Pencils
   Ditto masters
   Ditto paper
   Graph paper
   Ditto machine
   Poster board/construction paper
   Magic markers/crayons
   Rulers
   Dictionary/old newspapers

5. Procedure:

   a. Choose the most commercial newspaper within the vicinity.

   b. Discuss what to look for when visiting the newspaper. (Emphasis on cost and working conditions.)

   c. Students should take notes and take any hand-outs available during tour.

   d. Back in classroom, data should be discussed and compiled. Interest groups should be formed. (A student mini-newspaper should be started.)

e. Students should spend next several days working in their assigned interest area:

Advertising	News	Circulation
Publishing	Features	Accounting
Editing	Sports	Reporting
Editorials	Entertainment	Etc.

f. Students should purchase all needed materials on credit from supply room or teacher (and set wages - if any)

g. The accounting sheet and statistics should be charted every day.

h. The Advertising department should be buying time on the school P.A. system or putting posters in the halls.

i. After editing and publication, class should look at the financial outlay and determine the cost of paper and volume to be circulated.

j. Circulation of newspapers with money brought in tabulated.

k. An accounting of all materials used, the money spent and received should be charted.

l. A discussion of the differences between our newspaper and a regular commercial newspaper should be conducted at this point.

m. Various conclusions should be discussed and ways of improving any future editions should be drawn.

n. An understanding should be reached that commercial newspapers have to pay taxes on profits and meet certain environmental standards in their working conditions.

o. A final comparison of OUR environmental safeguards concerning OUR waste materials etc. should be discussed in concluding this unit.

6. Discussion Questions:

A. Planning a Field Trip:

1. What are the reasons for OWNING a newspaper?
2. What are the costs of running a newspaper?
3. What departments does a newspaper have?
4. What should a person look for that wants to work for a newspaper (wages, working conditions, feeling of accomplishment, etc.)

5. How does a newspaper help or hurt the community? (Jobs-taxes-commerce, etc.)
6. What role does a newspaper play in environmental affairs and education?

B. Field Trip.

1. Most questions asked here will be precipitated by remarks made by guide or people we are listening too.

C. Post Field Trip

1. Re-ask some of the earlier questions. Children will now have a different perspective.
2. Which aspect of newspaper work interests you the most? Why?
3. Now that you have chosen a particular area of newspaper work, what do you feel your role is?
4. How do you feel you can most effectively handle your role?
5. Are there any places we can cut costs in your area? Will this hurt the overall quality of our newspaper?
6. Do you feel there are any particular articles in your field that need to be in our newspaper?
7. What issues need to be covered editorially by us?

D. Day of Publishing and Selling.

1. What do we need to charge to break even or make money?
2. Will people pay that much?
3. How much of the cost does our advertisements pay?

E. Final Conclusions.

1. What waste materials do we have? What can we do with them?
2. Are you satisfied with the finished copy? Why?
3. Can we improve our next issue? How?
4. Can we improve our working conditions? How?
5. What conclusions can we draw from our accounting tables?
6. How do you think our newspaper has done compared to a regular newspaper? Why?
7. What would the introduction of taxes do to our newspaper?
8. What would we have to do to counter-act this?
9. Can you think of any other hidden costs?
10. One final question--Would you do it again? Why?

7. References:

Most newspapers have newspaper units available to classroom teachers.

Most encyclopedias will give material that will aide a teacher in gaining background information on the outlay and role of newspapers in America.

Upper Elementary Richard H. Willhite

Costs of Production

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: The cost of producing a particular product includes such things as the resources used, wages of workers, advertising, taxes, and improving working and environmental standards.

3. Time: One day

4. Materials:

    a. Access to a car made in the U.S.A.
    b. Colored string or yarn.
    c. Several large sheets of poster paper.
    d. Thumbtacks.
    e. Shoebox or similar-sized container.
    f. Scissors.
    g. Paper and pencil for each student.
    h. Crayons or colored ink markers.
    i. Access to an encyclodedia and dictionary.

5. Procedure:

    a. Have the students prepare a large outline map of the world on one of the sheets of poster paper using different colored crayons or markers for different countries.

    b. Examine the car and develop with the students a list of all the major raw materials needed to build an automobile.

    c. On the world map, have the students find the sources (countries) of these materials with the help of the encyclodedia and dictionary.

    d. Locate Detroit on the map, and using thumbtacks and colored string, have the students connect Detroit with the countries from which the raw materials originated.

    e. Have each student write his or her name on a slip of paper suitable for use in a name-drawing.

    f. Place the names in the shoebox.

    g. Draw names out of the shoebox so as to randomly divide the class up into groups of three.

    h. To each group of three, distribute one large sheet of poster paper and a crayon or ink marker.

i. Assign each group one of the raw materials which was included in the list of automobile component materials.

j. Have each group develop a "worker chain" on a sheet of paper, tracing the jobs which have to be done to process the raw material and finally deliver it as part of an automobile to the consumer. Example: Rubber - rubber tree grower - tree plantation helper - latex collector - raw rubber truckdriver - latex processing plant worker - etc. - tire for automobile.

k. When each group has finally developed what seems like a complete chain, have them transfer their worker chain to a sheet of poster paper.

l. Have each group explain their worker-chain to the entire class.

6. Discussion Questions?

a. How many countries contribute to a car "made in U.S.A."?

b. How do carmakers determine the cost of a car to the public?

c. How would the cost of a car be affected if the cost of processing rubber were to double?

d. How would the cost of a car be affected if workers in a major auto-glass factory demanded that equipment be installed in their plant which would reduce the level of glass-dust in the air?

e. What will happen to the cost of automobiles in the United States if other countries begin making and using as many cars as we do? Why?

f. Would there be a change in the cost of autos in the U.S. if this country and a major foreign supplier of an important raw material for cars were to have a trade agreement lowering import and export taxes?

g. How does advertising affect the cost of cars to buyers?

h. How has car-production in the U.S. changed over the last 60 years?

i. What are the kinds of pollution that cars produce?

j. How does the car buyer pay for the pollution that cars produce?

7. References:

a. Environmental Educational Instructional Activities for Grades K-6, New York State Education Department

Upper Elementary

Richard H. Willhite

Pollution Costs

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: There are two kinds of costs associated with pollution: the cost of preventing pollution, and the cost of (or damage from) pollution once it occurs.

3. Time: two days - day 1 - site cleanup and telephone contacts.
   day 2 - compiling data and discussion.

4. Materials:

   a. Your school site and access to it.
   b. Large paper or plastic trash bags.
   c. Telephone directory and access to a telephone.
   d. Paper and pencil for each student.
   e. Large sheet of poster paper.
   f. Crayons or colored ink markers.
   g. Bathroom scale.
   h. Old newspaper.
   i. Scissors.
   j. Shoebox or similar-sized container.

5. Procedure:

   a. On the poster paper, draw a map of your school site and the streets immediately adjacent to it. Ask students to help think of features which should be included, i.e. buildings, paved areas, planted areas, etc.

   b. Divide the students into groups of five.

   c. Distribute one trash bag to each group.

   d. Have the groups collect as much litter from the total site area as possible over a one or two hour period. If appropriate, also extend the pick up to the streets immediately adjacent to the school site, as mapped on the poster.

   e. Upon returning, have the students write their names on equal-sized slips of paper as can be used in a name drawing.

   f. Place these in the shoebox.

   g. Have one student draw three names from the shoebox.

   h. These three will contact:

      (1). The school's custodian.

        (a). Have them tell the custodian that their class is doing a study of the cost of cleaning up litter.

        (b). Have them ask him how much time it takes him to pick up litter from the site.

        (c). Does he consider littering to be a problem at the school?

        (d). Do outdoor trash cans at the school (if any) help, or are they used only occasionally?

    (2). The school system's Building Maintenance office.

        (a). Have them phone the office and explain their purpose.

        (b). Have them ask for the number of custodial personnel employed system-wide.

        (c). Is school site littering one of the major problems the office must deal with?

        (d). Can the office give them an idea of how much money of their annual budget goes to litter pick up and disposal?

        (e). How does the office dispose of litter after it is picked up?

i. Have the other students sort the litter on sheets of newspaper according to what it is made of, i.e. paper, glass, metal, etc.

j. Have them weigh and record the weight of each pile.

k. On the map, have the students indicate with small "x" marks those locations where litter was picked up.

l. Have the three students chosen to contact the school's custodian and the Building Maintenance office report their findings to the class.

6. Discussion Questions:

    a. Did you find any concentrations of litter when all the "x"s were placed on the map?

    b. How can you account for these?

    c. What was the total weight of the litter you picked up?

d. If each of you was paid $3.00 per hour to pick up litter around your school, what would be the cost per pound of the litter you picked up?

e. At that cost, how many pounds of litter would the Buildings Maintenance office be paying for each year, according to their budgeted amount for litter pick-up?

f. Judging from the "x"s you placed on your map, where might all this trash come from?

g. What kinds of litter did you pick up?

h. Were the pieces of litter you found designed to be disposable by their manufacturers?

i. List the names of the different kinds of materials that went into making the litter in the different piles.

j. Judging from the weight of the piles, which material was used most of in making the things that ended up as litter?

k. If your school has outdoor trash containers, are they used regularly? Why or why not?

l. How does your school dispose of the litter that the custodian collects?

m. Is this disposal method different from that used in other schools? Why or why not?

n. Judging from the way that litter is disposed of at your school, how many jobs are involved between the time the litter is tossed out by someone and finally disposed of in the place it ends up in?

o. Why is the disposal of litter so costly?

p. Would you enjoy the job of picking up litter for a living? Why or why not?

q. What would your school site look like if litter was never picked up and disposed of?

r. What are some of the reasons why people litter?

s. Who are some of the people who pay for litter pick up and disposal?

t. Would it be cheaper to continue littering or for everyone individually to dispose of his trash?

u. Could the materials used in manufacturing the things we dispose of be used to manufacture other things?

v. Is this being done now in your own community? Why or why not?

Upper Elementary

Darrell Donelson

Who Pays

1. Concept to be developed: Economics and Technology.

2. Understanding to be developed: There are two kinds of costs associated with pollution: the cost of preventing pollution, and the cost of (or damage from) pollution once it occurs.

3. Time: 6 days - day 1 - Best Day is Friday - Discussion of understanding to be developed and what type of things we should be looking for. Homework: Walk through building and grounds and immediate neighborhood. Talk to parents-teachers-neighbors.
   day 2 - Compile and chart data obtained. Discuss conclusions drawn. Plan for guest speakers.
   day 3 - Panel composed of principal-school engineer-custodian-parent-community worker-lunch room staff member (all or some of the above). Requires pre-planning on your part.
   day 4 - Discussion of what was presented day before. Conclusions that are drawn. Plan a Positive Action Day.
   day 5 - Positive Action Day
   day 6 - Discussion P.A.D. and future goals and plans.

4. Material: School grounds, neighborhood panel, staff and community members, note pad, pencil/pen, magic markers, construction paper/poster board.

5. Procedure:

   a. Discussion of pollution and the costs associated with its prevention and cure.

   b. Assign students the homework of going through the school/grounds/home/ and neighborhood gathering data on pollution preventitives and pollution cures.

Sample Card

SCHOOL

Preventitives	Cost	Cures	Cost
Waste Baskets 28	$140	Custodial staff	
Incinerator 1		Incinerator	
Lunch waste con. 6		Alum. Recycling Center	
Air filters/blowers		Waste Paper Collection Center	
Window screens		Painting of bathroom	
Custodial staff		Chlorine added to pool	
Accoustical tiles			

c. Have students turn in list of and discuss what their family does in the area of pollution prevention and pollution cures. (Make sure they add cost and time involved.)

Sample Card

FAMILY

Preventitives	Cost	Cures	Cost
Waste containers		Painting gutters (rustproof)	
Use recycling centers		Pick up litter in yard	
Use returnable bottles		Bundle newspapers	
Save and Reuse paper bags		Keep air pollution controls on car	
Use hand mower		Wash windows	
Cut down use of air conditioner		Compost grass shavings	

d. Compile list for entire class. (Give copies to rest of school).

e. Have principal-school engineer-custodian-parent-member of lunch staff-community worker give panel presentation on what they are doing in this area.

f. Students will have a question and answer period with panelists at conclusion of program.

g. Have students discuss their notes of the day's activit after panel has left.

h. Have students update their lists from 'd'.

i. Discuss how pollution preventitives and aesthetical quality go hand in hand.

j. Discuss the role of us-school-community-state-nation and world in preventing pollution and the cost involved in preventing and curing pollution.

k. Plan a Positive Action Day.

l. Have the Positive Action Day.

Example of one Positive Action Day

NEIGHBORHOOD AND SCHOOL LITTER BRIGADE

1. Chart and plot neighborhood.
2. Assign clean-up area by grade level (kindergarten--halls; oldest children greatest distance)
3. Have kids bring litter bags from home. School will provide large receptacle. City will haul litter to dump.
4. Pick up litter only. Note location of large items and give to city.
5. Weigh litter collected and invite community to see it. (Advertise day and time of brigade.)
6. Invite city officials and newspapers to be on hand.
7. Try to get an estimate of the cost it would have taken to have the city/community do this.
8. Publicize results and statistics obtained.

m. Discuss the benefits to each person the school and community from the Positive Action Day.

n. Compare what we have done to industry and their problems.

6. Discussion Questions:

   a. Name some examples of the costs associated with preventing pollution?

   b. Name some examples of the costs associated with damage caused by pollution.

   c. What are the examples of pollution preventitives or cures in and around our school and neighborhood?

   d. Who do you think could help us in finding what is being done here at school? Why?

   e. Who do you think could help us in finding what is being done at home and in the neighborhood? Why?

   f. Can you think of any questions to ask our panel members? Why?

g. What would you do in this area if you had their job?

h. Do you think our panel members help us in understanding this area better? Why?

i. What did you learn?

j. Where do we go from here?

k. What can we do to have a Positive Action?

l. Was our Positive Action Day a success? Why?

m. Do you think industry would handle their problems the way we did? Why?

n. What can and does industry do in this area?

o. What Positive Action Day should we have next?

7. References:

People mentioned would be best references. See them before hand.

There are many worksheets available on what homes and schools can do in preventing and curing pollution within their area.

Upper Elementary Richard H. Willnite

Not For Sale

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Some pollution costs cannot be put into dollars and cents.

3. Time: 60 minutes.

4. Materials:

   a. Recording of Debussey's "Clair de Lune" (readily available from the classical music section of your Public Library's record collection).
   b. Cassette tape recorder and blank tape.
   c. Record player.
   d. Paper and pencil for each student.
   e. Access to a busy traffic intersection.
   f. A clock or a watch.

5. Procedure:

   a. Obtain a recording of "Clair de Lune" and check the time length of the recording (usually 14 minutes).

   b. Play the recording for yourself if you have never heard "Clair de Lune" before.

   c. Prior to the exercise, stand on the corner of the busy intersection with the tape recorder and record ten minutes of traffic sounds.

   d. In the classroom, set up the record player and recording.

   e. Explain to the students that they will be listening to some quiet music. The music they will hear was written over fifty years ago by a man who wanted to express his feelings in music about moonlight on a quiet spring night.

   f. Set the tape recorder up several feet away from the record player, and stand by it so that you can see a clock or a watch as the music is playing.

   g. The room light may be dimmed to enhance the feeling Debussey was trying to evoke in his music.

   h. Start the music, adjust the volume to a comfortable level, and note the time carefully.

   i. Allow the music to continue until it approaches the final four or five minutes.

j. Then, start playing the tape recording of the traffic noise and adjust the volume until it is louder than the volume of the music.

k. Allow the music to end, turn the record player off, then turn the tape recording off.

6. Discussion Questions:

a. How do you think the composer felt when he wrote the music?

b. Do you think that the composer would have felt like writing the music inside a factory or on a busy corner? Why or why not?

c. What did the music make you think of before the tape recorder was turned on?

d. Did the music make you feel good or bad? Why or why not?

e. Did you feel differently when the tape recorder was turned on? In what way?

f. Would you enjoy living in a house at a busy corner? Why or why not?

g. Why do some people live in some places like that?

h. Does it cost more or less to live in a peaceful and quiet place? Why?

i. Can money buy back a beautiful thing once it has been destroyed, so that it is as nice as it was before? Why or why not?

j. What are some reasons why some people destroy beautiful things which other people enjoy?

k. Is it important to have beautiful things around us? Why or why not?

l. Imagine the most beautiful thing you can think of. Would it still be beautiful if it were in a junkyard?

Upper Elementary

Ruth Fox

PHOTOGRAPHIC ESSAY ON URBAN BLIGHT

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Some pollution costs cannot be put into dollars and cents.

3. Time: Five class periods to be spread over two weeks and a 1/2- or 1-day field trip.

4. Materials: Cameras, slide film, projector, screen, school bus.

5. Procedure:

   a. Discuss with class various kinds of pollution and their effects.

      1) What are the kinds of pollution? Air, water, litter, garbage, noise, and visual may be listed, as well as others the class might think of.

      2) What are some of the results of these kinds of pollution? (accept what the children offer--aiming for some of the following)

         a) poor physical health

         b) tree problems

         c) rusting

         d) peeling paint and deteriorating paint

         e) dirty drapes

         f) poor mental health

         g) deafness

         etc.

   b. Discuss trip downtown (with possible trips around child's neighborhood, schoolyard, etc.) to identify Urban blight problems.

      1) Problems to look for downtown

         a) Repeat list from yesterday

         b) Add billboards, signs over stores, other ugliness.

      2) c) How about store windows, air-conditioners, heat, discomfort?

         d) Listen for noises; be aware of odors.

      3) Have children pick out specific subjects and/or areas to photograph to avoid duplication. They can then work in teams.

c. Take trip downtown

1) Walk around downtown area if small, or take the school bus to preplanned areas.

2) Have children look at and photograph signs of urban blight as they detect it on their tour.

3) Have students take pictures of what they like, or what interests them, also.

d. Have slides developed.

1) Form a committee to organize slides.

2) Project slides and dicuss kinds of blight shown. What kinds of blight didn't (or couldn't) we photograph?

e. Have students calculate actual costs of harm caused by some of the kinds of pollution. (math problems)

1) Bring up possibility of not being able to measure some of the costs.

2) Is it still harmful if intangible?

a) mental illness?

b) visual blight?

c) (others children bring up)

f. Work up program to show others.

1) Other classes who might then become involved.

a) What changes might we be able to make or cause to be made?

b) What is good about our town?

2) Consider discussing your results with the school board.

3) If the class is motivated, they might be able to talk to the city council or the mayor.

Junior High

Cynthia Addison

Bike Study

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Usually, the costs (economic, resource and technological) of goods and services vary proportionately to societal demands for those goods and services.

3. Time: 4 days - day 1 - explanation of study
   day 2 - research
   day 3 - making of video material
   day 4 - report day

4. Materials: supplies for making charts, bulletin boards, graphs, etc.

5. Procedure:

   a. The class will make an in depth study of something that has made a recent impact on society AND of particular interest to the 7th grade student. This example will be based on the bicycle explosion.

      1) Requirements for the study

         a) Students work in pairs on an area interesting to them.

         b) Students will make a visual display to support their findings. (Some students may wish to make a set of slides, movie or filmstrip instead of a chart, graph, bulletin board, collage, etc.)

         c) Students will make a brief oral report of findings and explain visual display.

      2) Suggested areas of study

         a) How has the recent demand for bicycles affected the price of bicycles over the last 5 years?

         b) How does the price of bicycles vary throughout the city?

         c) What materials are used in the construction of the bicycles? What are the major competitors for these materials?

         d) How has the bicycle affected the laws, interests, and expenditures of the city?

         e) What social groups have developed from bicycle popularity? What activities do these groups take part in? How does the group support itself?

         f) How has the increased use of bikes affected the jobs in your city?

         g) Public Interview - two or more groups may wish to work together on a joint questionnaire and then make separate reports.

            (1) Investigate public opinion of bike paths.
            (2) Investigate public opinion of laws concerning bicycles.

h) What expenses are involved with the use of the bicycle that are not included in the price of the bicycle? Include such things as equipment and upkeep.

i) What problems has the biking sport caused the police department? Vandalism? Accidents?

j) How has man's concern for the environment added to the biking boom?

k) Make a survey of the use of bikes in the city. Where are they used and for what reason?

l) What are the laws in your city concerning bicycle use?

m) What are the strengths and weaknesses of the different types of bicycles?

n) Mathematically prove why a 10-speed is faster. Investigate the wheel and axle first.

b. On the 4th (or 5th) day students report their findings to the rest of the class. Perhaps, the visuals can then be used for a display in the room or another part of the school.

6. Discussion Questions:

a. What is the most important reason(s) for the bike "boom"?

b. If there were a network of bike paths in your town, what do you think would happen to the price of bikes?

c. How many class members have bikes?

d. Do you use your bike only for recreation? What other uses? School? Errands?

e. Can you think of any reason why the cost of bikes would go down?

Junior High Richard H. Willhite

Product Demand and Cost Impacts

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Usually, the costs (economic, resource and technological) of goods and services vary proportionately to societal demands for those goods and services.

3. Time: Two hours - hour 1 - gaming simulation.
   hour 2 - discussion.

4. Materials:

   a. Clock or watch.

   b. Shoebox or similar-sized container.

   c. Scissors.

   d. Paper and pencil for each student.

   e. Ditto masters and access to a ditto copier.

   f. "Game overview" card for each group of five students in the class:

   > "Consumer demand for a product determines, to a large degree, the price of that product. Many factors influence the level of consumer demand, which in turn influence product price. The purpose of this exercise is to examine how some of these factors operate to help influence demand for and price of a product."
   > "Imagine that you are a member of the Presidential Economic Advisory Board. Your task is to predict how the price and consumer demand for oranges will change in a variety of different situations."

   g. "Specific situation" cards for each group of five students in the class:

      (1) Situation 1: "A crop failure strikes two-thirds of the country's orange groves."

      (2) Situation 2: "A team of medical researchers finds that oranges contain a unique vitamin which tends to prevent heart attack for people who eat more than two oranges per day."

      (3) Situation 3: "Orange grove workers form a labor union and go on strike to protest poor wages and working conditions."

      (4) Situation 4: "Someone invents an orange-flavored drink which contains an amount of the heart-attack preventing vitamin equal to that contained in oranges, but the new drink is only half as expensive to produce as natural orange juice and many people think it tastes better."

(5) Situation 5: "A Florida orange grower discovers that crop yield can be quadrupled by adding a newly discovered fertilizer to the orchard soil."

(6) Situation 6: "The federal government signs a trade agreement with the Soviet Union whereby three-forths of all oranges grown in the U.S. over the next five years will be traded to Russia in exchange for vodka and Siberian ice cubes."

5. Procedure:

a. Have the students write their names on equal-sized slips of paper suitable for a name drawing.

b. Place these name slips into the shoebox and draw names from the box so as to randomly divide the class into groups of five.

c. Previous to the exercise, have the "situation" cards typed and dittoed, so that each of the six cards can be distributed to each group if the class were to be divided into groups of five members.

d. Also previous to the exercise, have a set of "game overview" cards typed and dittoed so that one card can be distributed to each group if the class is divided into groups of five.

e. Distribute one "game overview" card to each group.

f. At every ten-minute interval over the next hour, distribute one "situation" card to each group, so that by the end of the hour, all groups have discussed each situation, as described on the cards.

g. As the groups receive each "situation" card, have them predict how and why the demand for and price of oranges would be affected. These predictions should be recorded for each situation.

6. Discussion Questions:

a. In a free-market economy, such as operates in the U.S.A., is the price of oranges flexible or inflexible as different situations arise?

b. Do the groups' predictions differ from one another as about the same situations?

c. Over all the situations, how does consumer demand for oranges affect their prices?

d. What are some of the factors which influenced consumer demand for oranges?

e. Does this exercise reflect real-world product price fluctuations?

f. In the "real world", what factors have historically contributed to consumer demand for petroleum products and their prices?

g. In the case of oranges, would consumer demand have any affect upon the wages and working conditions of orange-grove laborers? Why or why not?

h. How does the price of oranges really change over a period of one year?

i. How can you account for these fluctuations?

j. How have changes in consumer demand for automobiles altered raw material usage over the past fifty years?

k. Besides oranges, what other product prices fluctuate yearly? How can you account for these fluctuations?

Junior High Ann P. Sibole

Swinus Americanus!

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Patterns and practices of using the earth's resources are largely determined by people's life style, and the level of industrialization necessary to meet the demands of such life styles.

3. Time: 1 period - 90 minutes.

4. Materials: blackboard or overhead projector
   Question sheet (see #5. Discussion Questions.)

5. Procedure:

   a. Students form triads. Develop a list of the ways animals change their habitat. (example - beaver dams up streams, Opposite each, list the reason or reasons the animal makes the change. (Most of them will be for food or shelter or protection.)

   b. Then have them list ways man changes his environment. (Most of them will be economic - Xmas tree plantations, farming, lake shore recreation, etc.) You may prefer to do this either initially, or in summing up, on the board or overhead.

   c. Have students work individually now:

      Make a list of 13 appliances or uses for electricity in their home. When the lists are complete, have them do the following:

      1) Put a line under 3 which you could absolutely not live without.

      2) Put an X in front of 3 you could most easily live without.

      3) Put a 5 in front of those which you or your family did not have five years ago.

6. Discussion Questions:

   a. How do animals' reasons for changing the environment differ from man's reasons?

   b. Does man have some of the same reasons as animals? Give examples.

   c. From what you may know about the American Indian's life style, did he change his environment?
      Does his impact seem as great as the impact each of us has on our environment? Explain and support your answer.

d. Did your family have fewer electrical appliances five years ago? How many less? How have the recent additions drastically improved your home life?

e. Find out what your monthly electric bill was for the last 2 months. Add them, divide by 2, then divide that by the number of people who live in your home. What is the average cost of electricity per person in your home?

f. How does it compare to other people in your class? Higher or lower? What might account for some rather big differences among families?

g. Write a short paragraph describing the changes that would occur if the 3 Xed electrical uses were eliminated. How would it alter your daily routine or that of another member of your family? Could it improve it in any way?

h. Do you have any ideas why we think we need these new convenience appliances and other items being developed each day, thanks to modern technology and mass production?

Junior High

Judith DeWitt
M.D. O'Farrell

Life Styles and their Influences on Natural Resources

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Patterns and practices of using the earth's resources are largely determined be people's life styles, and the level of industrialisation necessary to meet the demands of such life styles.

3. Time: 5 days - day 1 - Introduction of concept
   day 2 - Film and discussion
   day 3 - Student and parent survey and Newsreel handout to be read
   day 4 - Film and handout discussion
   day 5 - Discussion on comparison of student and parent survey

4. Materials:

   a. Student wall chart
   b. Parent survey
   c. Ditto of handout

5. Procedure:

   a. Introduce the understanding using as a background the following: Energy and natural resource consumption in the U.S. is at an all-time high and predictions for the future indicate that it will increase sharply. Many of these natural resources are non-renewable. That is, when we use them they cannot be reused or recycled. Today energy use is an important part of our life style. Ironically the solution to many of our environmental problems (land, water, air) requires additional uses of energy and natural resources. Thus we seem to be confronted with somewhat of a dilemma.

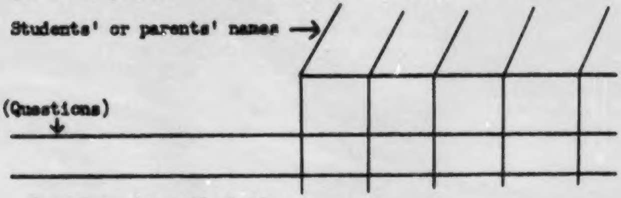
   b. Have students fill out Student Questionnaire (written on board or handout):

      (1). How many cars are in use in the U.S. today?
      (a) 40 million (b) 75 million (c) 112 million
      (2). How many cars are manufactured yearly?
      (a) 6 million (b) 13 million (c) 18 million
      (3). How efficient is the auto in terms of energy consumption?
      (a) 15% (b) 45% (c) 80%
      (4). How much land in your city is devoted to the use of the automobile? (a) 10% (b) 40% (c) 60%
      (5). How much air pollution today is attributable to the automobile? (a) 10% (b) 40% (c) 60%
      (6). Iron, as the basic raw material in the production of the auto, is a (a) renewable resource
      (b) non-renewable resource (c) recyclable resource

c. Show film: "Automobile: The Great Love Affair", color, 56 min. (CBS; McGH, 1966) This film is about the automobile as part of the American mystique and its impact on the economy and living patterns of Americans. Automobiles are symbols of status and conformity. Class discussion following the film.

d. Assign for reading the handouts on the energy crisis: "The Energy Crisis", Newsweek, January 1, 1973.

e. Post the student wall chart. Students will fill out their section by the next day. Have students take questions home to get their parents' responses and fill in that section also.



Questions for wall chart:
1. How do you usually get to school?
2. If you have to go a distance of less than two miles, what form of transportation would you use?
3. If you have to go a distance of more than two miles, what form of transportation would you use?
4. How many cars does your family have?
5. Would you use mass transit (bus, train) if available?
6. Which would you prefer to take: a train or a plane?
7. Do you think the air pollution control devices on autos are necessary?
8. If you had a 1975 model car, would you use no-lead, low-lead or regular gasoline?

(For parents, modify #1-5 to apply to when they were the same age as their children now.)

6. Discussion Questions:

a. How did your answers on the survey compare with your classmates? With your parents?

b. Does your life style demand products from industry?

c. Could you change your life style so that you will not need industry's products?

d. Would you be willing to change your life style? Are you satisfied with the demands you are making now?

Junior High

Richard H. Willhite

Resource Consumption, Past, Present and Future

1. Concept to be developed: Economics and Technology.

2. Understanding to be developed: As the production of goods increases with demand, consumption of resources also increases.

3. Time: Two hours - hour 1 - gaming simulation & role comparison.
   hour 2 - discussion.

4. Materials:

   a. Paper and pencil for each student.

   b. Clock or watch.

   c. Shoebox or similar-sized container.

   d. Scissors.

   e. One "situation card" for each of one-half the class members: "Looking ahead into the future, what kind of place would you like to live in as an adult? List those things you would like to have as an adult."

   f. Another "situation card" for each student in the other half of the class: "You are the same age you are now, but you were born in 1866. The Civil War has just ended. Main means of transportation are by foot, by rail, and by horse. Most people are engaged in farming, and most people live in the country rather than in the city. Only a very few young people go to college; most make a living by farming or entering one of the trades (plumbing, construction, blacksmithing, etc.). Electricity has only been recently "discovered", and most homes have Kerosene lamps, a hand pump for water, and an outhouse. Vegetable gardens are common. You have no indication that cars or electricity will ever be available or useful in the home or for work. On this basis, list the things you would like to have as an adult in your home of the 1880's or '90's."

   g. Blackboard and chalk.

   h. Ditto masters and access to a ditto copier.

5. Procedure:

   a. Previous to the exercise, have each "situation" card typed and dittoed so that one situation card can be distributed to one-half of the class, and one of the other situation cards can be distributed to the other half of the class.

   b. Have the students write their names on equal-sized slips of paper suitable for a name drawing.

c. Place these in the shoebox.

d. Draw names from the shoebox so that the class is divided randomly into two groups.

e. To the members of one group, distribute the first set of "situation cards".

f. To the members of the other group, distribute the second set of "situation cards".

g. Ask all class members to write a paragraph or two about their adult lives, on the basis of information provided on the cards, and to list those things they would like to have as adults in their situations (a carriage, a car, a farm, a professional business, etc.).

h. Have the students describe the lifestyles they would lead in their situation, and to name the things they might own.

i. List these possessions on the blackboard, making one list for the "modern-day" students and another list for the 19th century students.

6. Discussion Questions:

a. Comparing items from the two lists, which set of possessions requires more resources to manufacture them?

b. Why do the modern possessions require more resources than those manufactured in the 1800's?

c. Judging from the items on the two lists, how has resource consumption changed over the last 100 years?

d. What factors have brought this change about?

e. How have prices changed for resources used now and for the same resources used 100 years ago?

f. What factors have brought this change about?

g. Judging from these patterns of change, what can you predict about resource use and resource prices in the next 100 years?

h. What can be done to alter this?

i. How many children would you like to have? (Total these for the entire class.)

j. How will all these new people affect the future pattern of resource use and price?

k. How does advertising affect consumer demand for products and resource usage?

l. Do advertisers show a concern for resource usage? How? Why or why not?

m. Would it be possible for everyone in the U.S.A. to grow his own food and make his own clothes? Why or why not?

n. What are some activities you do which require no resources at all?

o. Are there any human activities which require no resources at all?

Junior High

Michael D. O'Farrell

Study in Demand and Consumption of Natural Resources

1. Concept to be developed: Economics and Technology

2. Understanding to be developed; As the production of goods increases with demand, consumption of resources also increases

3. Time: 4 days - day 1 - introduction to concept and class survey, to be retained by students
   day 2 - film
   day 3 - discussion questions
   day 4 - give questionnaire again with discussion following

4. Materials: Class survey

5. Procedure:

   a. From the following list of items indicate your personal preference by circling the letter of your selection.

1.	regular toothbrush	or	1.	electrical toothbrush
2.	regular comb		2.	electric comb
3.	towel dried hair		3.	electric hair-dryer
4.	safety razor		4.	electfic razor
5.	regular shaving cream		5.	heated shaving cream dispenser
6.	regular electric fan		6.	air conditioner
7.	hand washed dishes		7.	electric dishwasher
8.	hand operated can opener		8.	electric can opener
9.	self-defrost refrigerator		9.	frost free refrigerator
10.	black and white TV		10.	color TV
11.	regular record player		11.	deluxe stereo unit
12.	fuel oil heat		12.	electric heat
13.	use alternative sources of energy (sun, wind, water)		13.	nuclear energy
14.	ride a bicycle		14.	drive a car
15.	Volkswagon		15.	Ford LTD
16.	drive a car		16.	ride a bus or mass transit
17.	take a train		17.	fly in a jet
18.	returnable containers		18.	non-returnable containers

   b. Film "Ravaged Earth" - 27 min, color, very dramatic exploration of the demand for natural resources and the resulting environment impact and cost - followed by class discussion.

6. Discussion questions

   a. How do your choices reflect the typical American life style?

   b. Should we limit people's rights to own energy and natural resources using devices like air conditioners, electric heat, electric toothbrushes? Why or why not?

c. There will always be a little pollution in order to be prosperous, so why should we concern ourselves about it? Do you agree or disagree with this statement and why.

d. The standard of living in the U.S. is the highest in the world. Should we maintain it as such? Why or why not?

e. If you were to be taxed each time you used your electric toothbrush would you pay or protest? Why?

f. Some people argue that we ought to live without all the comforts of life. Do you agree, disagree and why?

g. Should we raise the cost of natural resources and energy so that people will regulate their use?

h. If man continues his present patterns in growth and use of goods, what dangers do you see in the future?

i. Give students the same survey again and have them compare their first selections with their test.

7. Give students questionnaire again and compare first and second responses.

8. References: Deciding How to Live On Spaceship Earth, 1973, R. Allen, C. Foti, D. Ulrich, S. Wooland. Plover Books, Winona, Minnesota, 55987.

Film: Ravaged Earth - color, 27 min. NBC (1969)

Junior High

Richard H. Willhite

Yearling Sows Up a Quarter

1. Concept to be developed: Economics and Technology.
2. Understanding to be developed: Both supply and demand of a product influence the cost of the product.
3. Time: One week - First day - Lecture by Livestock Exchange or Extension Service official. Next four days - Newspaper monitoring.
4. Materials:
    a. Telephone book and access to a telephone.
    b. Your daily newspaper editions for the current week.
    c. Paper and pencil for each student.
    d. Large sheet of poster paper.
    e. Blackboard and chalk.
5. Procedure:
    a. By telephone, contact your nearest Livestock Exchange or county Agricultural Extension Service office.
    b. Ask whether or not it would be possible for an official of the agency to visit your class to explain how grower-supply and buyer-demand affect livestock prices.
    c. Ask the official to tell your students how to read the daily livestock market prices in the daily newspaper.
    d. Tell him that after his visit, you would like your students to be able to interpret these livestock market reports and the daily "farm market" reports broadcast by most television and radio stations.
    e. Just prior to the arrival of the agency official, post the most recent livestock market prices on the blackboard. The official can then use these to help students interpret market prices in the newspaper.
    f. After the agency official has left, have students post daily livestock market prices on the sheet of poster paper every day for the next week.
6. Discussion Questions:
    a. Have the market prices for different farm products gone up or down during the week?

b. How do you account for differences in the ways different product prices fluctuated over the five day period?

c. What are the factors which determine whether the price of a farm product goes up or down over a given period of time?

d. How would the price of cattle be affected if the price of corn were to go down and stay at a low level for a long period?

e. What are "future market prices"?

f. How are these determined?

g. What is the role of the consumer in setting livestock market prices?

h. If the consumer population were to double, and the livestock grower population stayed at its present level, how would livestock prices be affected?

Junior High

Pat Baron

Purchasing a Lunch

1. Concept to be developed: Economics and Technology.

2. Understanding to be developed: Both supply and demand of a product influence the cost of the product.

3. Time: 2 days - day 1 - planning and purchasing
day 2 - lunch

4. Materials: (Based on a class size of 30)
Play money - $10 per student
10 bags of potato chips
40 chocolate chip cookies
3 pizzas
20 white milk
10 chocolate milk
10 soda pop
20 sticks of gum

5. Procedure:

a. Arrange for the class to have lunch together in the classroom. All students would be required to attend on this day unless there would be a dietary problem.

b. To offset food costs, let students share costs since they will not be buying a school lunch.

c. The day before the lunch, set up two competing stores with two students running each store.

Store #1 will be selling:
1. 5 bags of potato chips
2. 20 chocolate chip cookies
3. 1 pizza
4. 10 white milk
5. 10 soda pop
6. 10 sticks of gum

Store #2 will be selling:
1. 5 bags of potato chips
2. 20 chocolate chip cookies
3. 2 pizzas
4. 10 white milk
5. 10 chocolate milk
6. 10 sticks of gum

d. Students will order and purchase food items a day ahead of time to limit food spoilage.

e. Give each class member $10 in play money. Let them buy whatever they want for lunch with it.

f. Store owners may set whatever prices they want for various food items. They should be encouraged to get what the market will bear. Perhaps the store with the most profit at the end of the day would give a prize such as a free dessert, etc.

g. The second day pass out the food as previously paid for by the students.

6. Discussion Questions:

a. What happened when some items were in great demand?

b. What happened to those food items few people wanted?

c. How do actual store owners get their food and goods that they sell?

d. What influences the supply of goods available to a store?

e. What factors besides price and taste would determine public demand for various goods?

Senior High Richard H. Willhite

Economic System Comparison

1. Concept to be developed: Economics and Technology.

2. Understanding to be developed: Economic systems constitute the societal arrangements for producing and distributing the goods and services that individuals and societies desire.

3. Time: Two days day 1 - research assignments.
   day 2 - discussion.

4. Materials:

   a. Access to your school's and/or community's library.
   b. Paper and pen for each student.
   c. Slip of paper for each student, suitable for use in a name-drawing.
   d. Shoebox or similar-sized container.
   e. Blackboard and chalk.

5. Procedure:

   a. Have each student write his or her name on a slip of paper.

   b. Place the slips in the shoebox, and by drawing out names randouly, divide the class into four groups of equal size.

   c. Explain to all four groups that their tasks will be to perforu research using the library, to answer questions about four "kinds" of economic systems. When each group has completed its research, it should incorporate its findings into a "group paper" which it will present to the entire class on the following day.

   d. Assign one group the task of researching a "pure free market econouy" (such as Japan's resembles).

   e. Assign the second group the task of researching the workings of a tightly "controlled economy" (such as the Soviet Union's resembles).

   f. Assign the third group the task of researching the workings of an economy based on the principals of "social democracy" (such as Sweden's econouy resembles).

   g. Assign the fourth group the task of researching the working of "feudal" economy. (such as Columbia's economy resembles).

   h. On the blackboard, list the following points:

      1) Definition of the assigned economy-type.
      2) Names of at least three countries whose economic systems closely exemplify the type assigned your group.

3) Major imports and exports of those countries.
4) Average annual per capita income of citizens in those countries.
5) Major economic goals of those countries.
6) Kinds of Political systems operative in those countries.
7) Level of industrialization in those countries.
8) Environmental quality for the average citizen in those countries.
9) Degree of apparent citizen-satisfaction with the economic system of those countries.
10) Apparent responsiveness of those countries' governments to changing citizen needs and desires.
Etc.

i. Allow the students to determine who will do research on which of the above points, and to develop their own strategies for completing the assignment on schedule.

6. Discussion questions:

a. On the basis of your research, does it appear that certain political systems seem associated with certain types of economics?

b. Is apparent citizen satisfaction ever associated with a given kind of economic system?

c. Of the four systems you studied, which one would you judge to have the greatest negative impact upon the world environment? Why?

d. Of the four systems under which one does the greatest number of people live?

e. Of the four systems, in which does the advertising of consumer goods play the greatest role?

f. Under which of the four economic systems would you choose to live if you had to make the choice?

g. Which of the four systems would you expect to be most often associated with an unstable government?

h. How do political and economic goals differ between countries exemplifying each of the four systems.

i. How do the four systems differ in the ways they meet consumer demand for goods and services?

j. How do the four systems differ with respect to the priority they place on individual wellbeing vs. collective well being?

Senior High

John L. Adams
Marge Gnau
Jim Seurynck

DEBATE:
Economic Effects on the Environment

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Economic systems constitute the societal arrangements for producing and distributing the goods and services that individuals and societies desire.

3. Time: 3 days:
   Day 1: Debate
   Day 2: Continue the debate
   Day 3: Discussion and application of the understanding

4. Materials:
   chalk, eraser, board, debate items listed in bold print

5. Procedure:
   a. Relate the following to their effects on the environment:

      FREE ENTERPRISE VS. CENTRALIZED GOVERNMENT CONTROL

      AUTOMATION VS. INDIVIDUAL LABORS

      AGRARIAN VS. INDUSTRIALIZED LABORERS

      DEVELOPMENT OF NATURAL RESOURCES VS. IMPORTATION OF FOREIGN GOODS

6. Discussion Questions:

   (REACTION TO THE DEBATE)

   a. How does selfishness degrade the free enterprize concept?

   b. How is strong governmental control an invitation to sloppiness?

   c. How is a bureaucracy apt to become a target for free enterprize?

   d. Can any nation successfully survive with an economic system which is totally free enterprize or totally centralized by the government?
   e. Apply the same question to agrarian vs. industrialism.

f. How can automation be detrimental to an individual?

g. What procedures or measures can be taken to minimize these detriments?

h. What political implications result when a country depends on other countries for importation of goods?

i. How can this principle cause the small nations to be the real powers in world politics?

7. References:

a. Ehrlich, Paul and Anne. Population, Resources and Environment, W. H. Freeman and Co., San Francisco, 1970.

b. Von Newmann, John. Theory of Games and Economic Behavior. Princiton University Press, 1953.

c. Piel, E.J. Man and His Technology. Mc Graw-Hill Book Co., N.Y. 1973.

d. Meadows, Donella and Dennis. The Limits To Growth. Universe Books, N.Y. 1972.

e. A Curriculum Activities Guide to Water Pollution and Environmental Studies. Tilton School Water Pollution Program, Tilton, New Hampshire, 1970.

f. Chute, Robert M. Environmental Insight. Harper & Row, Publishers, N.Y. 1971.

Senior High

Richard H. Willhite

The Social Cost of Water Pollution

1. Concept to be developed: Economics and Technology.

2. Understanding to be developed: Some businesses and industrial plants in the process of producing marketable products pass on social costs (i.e., air, water and noise pollution) to society.

3. Time: 3 days - day 1 - field trip
   day 2 - compile data, draw graphs.
   day 3 - discussion of findings.

4. Materials:

   a. Access to a nearby stream or river.
   b. Glass or clear plastic collecting jars.
   c. Masking tape.
   d. Felt ink markers.
   e. Secchi disc and cord (see appendix).
   f. Hack dissolved oxygen test kit (optional).
   g. Plankton net (see appendix).
   h. Bottom sediment scoop (see appendix).

5. Procedure:

   a. Have the students construct and collect together any of the above materials which are not already available (see appendix).

   b. Choose a stream or river for examination that runs through or past your community.

   c. Travel as far upstream as time permits and take samples at intervals of 1/2 mile for as far downstream as time permits.

   d. At each sampling location, have each student keep a record of:

      (1). Degree of water turbidity.
      (2). Results of dissolved oxygen test (if used).
      (3). Odor of water sample.
      (4). Amount and kind of predominant shore vegetation.
      (5). Kind of human activity taking place in the area (housing, industrial, farms, woodlot, etc.,).
      (6). Amount and kind of aquatic vegetation ("water weed", algae, etc.) present.
      (7). Observable aquatic animal life present.
      (8). Overall aesthetic quality of the water.

e. Obtain a sample of the water and the bottom sediment at each location. Label these carefully according to location with masking tape and a marking pen.

f. Upon returning, make up a large "river quality" table showing results of the tests and observations from site to site going downstream.

g. Arrange the water and sediment samples on a table in the order in which they were taken.

h. Have the students make careful observations about each water and sediment sample on the following inputs:

(1) Odor.
(2) Overall clarity of water.
(3) Amount and kind of animal life present in water and sediment sample.

i. Have the students graph dissolved oxygen test results (if used) with dissolved oxygen content at test sites on the verticle axis and distance from the first test site on the horisontal axis.

j. Have them graph Secchi disc results with disc measurement on the vertical, and distance from first test site on the horisontal axis.

6. Discussion questions:

1. How did the Secchi disc and dissolved oxygen test results change as they were taken farther downstream?

b. What makes water turbid?

c. Which of those turbidity causes can be attributed directly to human activity?

d. What is the relationship between degree of turbidity and aquatic plant growth?

e. If dissolved oxygen test results differed from point to point, how can you account for the differences?

f. What effect would varying degrees of dissolved oxygen have upon aquatic animal life?

g. Did the variety of animal life in the water changes as you went downstream? Why or why not?

h. Does the sediment appear to change in someways as one goes downstream?

i. At any one test site, did the quality of the water appear to change significantly? Why or why not?

j. Identify the points along your tested area of the river where industry or other human activity might alter water quality.

k. Do your tests and observations suggest any relationship between human activity and altered water quality?

l. What businesses or industries along your river can be identified as having a significant impact upon local water quality?

m. In what ways does the recreational value of the river increase or decrease as it flows along?

n. In what ways does your community make use of the river?

o. Are some of those uses in conflict with others? Which use dominates?

p. Does your community have a policy regarding water quality standards?

q. Are those standards enforced? Why or why not?

r. What is choliform bacteria? How is it used as an index of water quality?

s. What is meant by "passing along" the social cost?" of industrial pollution?

7. **Reference:**

Bachert, Russel E., Snooks, Emerson, L; Outdoor Education Equipment; Interstate Printers and Publishers, Inc; Danville, Illinois, 1974.

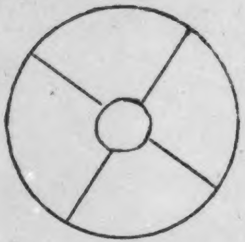
Appendix

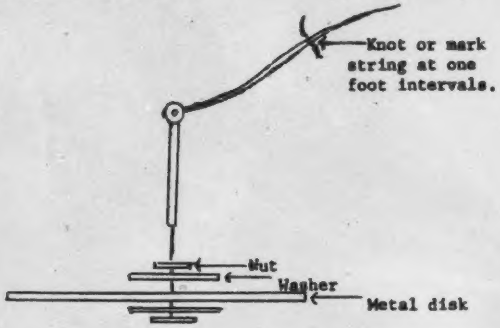
1. Secchi Disk

Materials: metal disc 5-6" in diameter cut from lightweight metal, metal washers, heavy string, black paint, white paint, eyebolt, nuts.

Procedure:

a. Cut disk from lightweight metal.
b. Drill hole in center for the eyebolt.
c. Place a metal washer and nut on the eyebolt on both sides of the disk. Add more washers if extra weight is needed.
d. Paint disk black and white for contrast.
e. Atach a heavy string to eyebolt and mark it at one foot intervals.
f. Lower the disk into water until it disappears and take a depth reading at this point. Lower it a few feet deeper, then raise it until it becomes visible. Take a depth reading at this point. Average these two readings. This is called the limit of visibility.





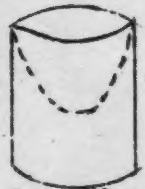
g. The Secchi Disk can be lowered into streams from a boat, an overhanging branch, or a bridge.

2. **Sediment Scoop**

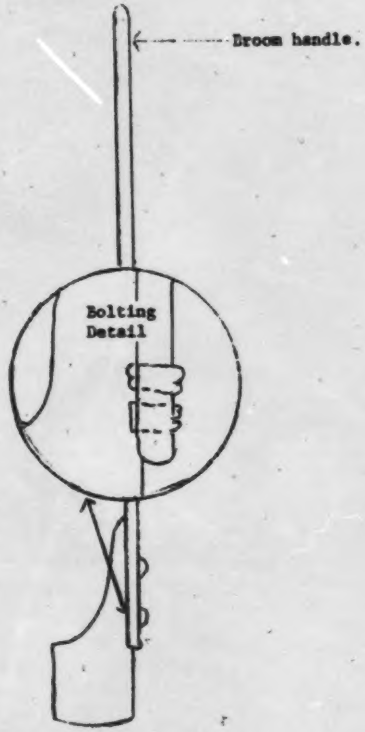
Materials: no. 10 can, broom handle, nuts and bolts, hammer and nails, drill.

Procedure

a. Using tin shears, cut a no. 10 can into a scoop as shown.
b. Punch several small nail holes in bottom of can to allow water to drain.
c. Drill two holes through the broom handle and can.
d. Bolt can securely to the end of the handle.



Cut no. 10 can to scoop form.



Senior High

John Kish

City-Industry Pollution Comparison

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Some businesses and Industrial plants in the process of producing marketable products pass on social costs (i.e. air, water and noise pollution) to society.

3. Time needed: 6 days - 2 days to determine base level of pollutants in city
   2. days to determine base level of pollutants in industrial areas
   1 day to compile data
   1 day to discuss problems and write up report for city and industrial areas.

4. Materials needed: City hall with assess to sewage treatment plant and to local sewage collection areas
   12 to 24 dishes of uniform size
   Glycerin- 1 pint
   Water test unit to include tests for Oxygen content
   Nitrogen level
   Phosphate level
   Mineral content
   Filter paper and funnels
   Noise meter or use of level meter on tape recorder
   Microscopes for examination of levels of micro organisms
   Beakers
   Titration tubes
   Litmus paper and water mister

5. Procedure: a. Tests for air pollution.
   1) Using dishes to collect particulate matter- Glycerin water mixture used so as to not allow water to evaporate (2 days for both city and Industrial area)
   2) Collect mixture and filter through for gross amounts of particulate matter and other materials which might have been collected.
   3) Using a mister and litmus paper determine the pH of the air surrounding the community and the industrial area (Done on minimum of 2 days)

   b. Tests for noise pollution.
   1) General tape recordings of areas around city and Industrial areas at all times during day and when both city and industrial area are in minimal use.
   2) Determine level of these noises by using either decibel meter or sound level meter on tape recorder.

c. Water Pollution tests
   1) if river flows through or around town test river before it comes near town and after it leaves town, also test river immediately after it leaves or goes near industrial area.
   2) Using water test kit establish levels of materials in water.
   3) Go to sewage treatment plant and test sewage as it is being treated and water after it has been treated.
   4) Obtain from city kind and type of sewage treatment and levels they expect from their treatment of sewage.
   5) Obtain from city amounts of sewage treated for entire city and for the industrial area and find out if it is possible to obtain test results directly from sewage as it comes out of industrial area before it is mixed in with entire city. If possible test sewage at these points.

d. Gather data from various tests, compile data and bar graph data against each other i.e. complete city against Industrial area.

e. Write up results of collected data and present copy of data and some possible solutions to problems to city council or mayor and to plants in industrial area being tested.

f. If more than one class is to be involved more than one area of city can be tested against the entire city to give a total idea as to the areas in the city which add to the problems of the entire city more or less than other areas of the city.

6. Discussion Questions.

   a. What effects could be imposed on the city if we were able to shut down industrial area until pollution levels were lowered.

   b. How could the city effectively change the pollution levels within the city itself.

   c. Why are given areas in the city lower in levels of pollution than others.

   d. What political action committies or stands should we as a group try to influence our parents toward.

7. References and Resources:

   a. Chemistry Teacher
   b. City Hall-Mayor or City Manager
   c. State government to establish pollutant limits for state control
   d. Zoning controls on pollutants.

Senior High **Ann P. Sibole**

Needs vs. Wants

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Satisfaction with the philosophy and functioning of the economic system is a major factor in the quality of life for individuals served by the economic system.

3. Time: 2 class periods

4. Materials: old magazines (beauty, housekeeper, man's magazines)
   Task cards-

   Discuss the following in groups of 3:

   a. Which list is longer, wants or needs?

   b. Who or what creates our wants? List 5.

   c. Go through several magazines in the classroom. Find ads which make you interested in having the product. Give the product name on paper then opposite the name, the kind of appeal the advertiser used on you to make you want his product. Was it sex appeal? Convenience appeal?

   d. Pay special attention to ads which might use the environmental bandwagon as a selling point. Cut out these ads - they will be used for a bulletin board display, later.

   Article: "I Have 7 Children" by Ellen Peck (from New York Times) - make ditto for students.

'I Have 7 Children' She Said to Wild Applause

By Ellen Peck

Susan, on "As the World Turns," has just had a baby. She is not the only one. Turning the daytime dial, we see that Chris, on "Where the Heart Is," has just had a baby, too. Within the past year, babies have also been born to Janet on "Search for Tomorrow," Meredith on "One Life to Live," Edie on "All My Children," Angel on "Love Is a Many-Splendored Thing," Diana on "General Hospital," Linda on "Days of Our Lives," Mary on "Where the Heart Is," Carolee on "The Doctors"... and "Another World's" Pat Randolph has twins.

Actually, the birth rate on daytime TV seems to rival that of Latin America!

If the pregnancies per se are demographically questionable, the way in which they are presented is often psychologically alarming: pregnancy is shown as women's way to become the center of attention, retreat from unresolved conflicts, or compete for men.

A classic natalist competition took place recently on "As the World Turns." Susan is married to Dan, who is in love with Liz (and is, in fact, the father of Liz's child). Sensing her husband's attraction to Liz, Susan became pregnant, hoping thus to win Dan's permanent affection.

That pregnancy was planned—at least by Susan—and such planning is rare on the daytime dramas. Most pregnancies are accidental. . . .

Actually, were all pronatalist, glory-of-motherhood-and-reproductive-function comments to be combined and presented to the F.C.C. Fairness Doctrine Committee, daytime TV would owe Planned Parenthood, Zero Population Growth and the National Organization for Non-Parents approximately 18,200 minutes of "equal time" for the past year's shows alone. . . .

Strong impressions are conveyed here: pregnancy will save your marriage; motherhood will fulfill you; bearing a man's child will make you supremely important to that man. Such messages are misleading (the "baby holds man" myth is dispelled by a simple glance at the divorce statistics); nevertheless, 12 of the 16 daytime dramas carry strong reproductive themes.

Daytime quiz and talk shows offer scant relief. Recently on "The Dating Game" a contest question was, "How many children do you want?" (Responses were "three," "three," and "five.") That same week, Garry Moore asked a "To Tell the Truth" contestant, "And what do you do?" She replied, "I'm a housewife and mother of seven children," and the audience applauded mightily...

An episode of last season's "Dick Van Dyke" series also deserves examination. It was called "Off and Running"; I call it "I Didn't Mean Us."

Situation: Dick hosts his own talk show. After interviewing an author and commending a book, "Overpopulation Begins at Home," Dick returns to his own home to learn that another child is on the way. He and Jenny already have a 16-year-old son and a 9-year-old daughter. Sample dialogue:

JENNY: You've always been so outspoken about the dangers of overpopulation and how responsible couples should replace only their own number ...

DICK: Honey...

JENNY: Didn't you mean what you were saying?

DICK: Yes, but...I didn't mean us....

5. Procedure:

   a. Hold a class discussion on what needs and wants are and the differences.

   b. Each student will list those things he needs on one side of a sheet of paper and those things which he wants on the other.

   c. Students will get into groups of 3 and follow the directions on a task card the teacher will hand out.

   d. When groups have completed task cards, hand out "I Have 7 Children", to be read.

   e. Hold class discussion on the article.

6. Discussion Questions:

   a. What wants do the TV quotes in this article support?

   b. List other wants or generally accepted American "ways" of doing things that TV ads or shows might support.

   c. Watch TV tonight (if you have one available), and look for the kind of life style TV is selling the public.

   d. Name some examples of environmentally sound TV ads or shows. (Example: A local junk yard is advertising that they accept and buy junk.)

7. References:

   a. Options, Population Reference Bureau, Inc. 1973. ($2.00)

   b. Vogue Magazine, January 15, 1972, Enticers 1970: On TV, Who Do They Think You Are, Stephanie Harrington.

Senior High   Harry Tindall

Letter to the Editor

1. Concept to be developed: Economics and Technology.

2. Understanding to be developed: Satisfaction with the philosophy and functioning of the economic system is a major factor in the quality of life for individuals served by that economic system.

3. Time: 3 to 5 days - days 1 & 2 - Reading the "Letter from Leningrad"
   selection of "roles" and formation of groups
   Preparation of answering letters
   days 3 & 4 - Reading and discussion of answering letters
   days 5 (possibly more) discussion

4. Materials: the "letter"
   writing paper and pens

5. Procedure:
   A "letter" has been printed in the New York Times from a "reader" in Leningrad, criticizing the American economic and social system (The letter was actually composed by the teacher, using familiar arguments and phrases. Such a letter is attached and may be used--or the teacher may wish to compose his own "letter" to fit the ability of the class. In this way he may make the letter as easy to answer as he wishes--or as difficult.

   a. Read the letter to the class. Answer questions, but do not discuss.

   b. Assign members of the class "roles" in the American system--a farmer, a lawyer, a doctor, a trucker, a U.A.W. official--any role they wish. Some may wish to work as a group.

   c. Each individual (or group) will compose a letter in his role, answering the letter to the Times.

   d. Read letters to class and stand ready to defend your arguments from class.

   e. Discussion of letters, esp. the "Letter from Leningrad".

6. Discussion questions:

   a. Who do you think the writer of the Leningrad letter is supposed to be? Is he well educated or a simple peasant?

   b. Is the writer really concerned about the American people or he merely pretending? Why do you think so?

   c. He writes that the time for capitalism has passed. Why does he think so? Do you agree?

d. How do you answer his observation that people are important in the Soviet Union, not profit?

e. How is price determined in this country? In the Soviet Union? Which is superior.

f. He says the land, the forests, the natural resources belong to everyone.

g. Where does our Leningrad correspondent get his information about this country? Discuss its reliability.

h. Is our present economic system "doomed"? Do large corporations such as General Motors really manipulate price? Discuss.

i. Why does the writer think pollution will never be solved under our present economic system? Do you agree? How does he say the Soviet Union is fighting pollution? Do you believe his "facts"? Discuss the value of a free press.

j. How does the writer compare politicans in the U.S. and the Soviet Union? How does a person become a member of Congress? How does a person become a member of the Supreme Soviet? Which method do you favor and why?

k. Discuss the writer's theories on shortages in the U.S. He calls us "wastrels" and gives examples of waste. Do you agree with him?

l. Do you agree that eventual shortages will ultimately result in the loss of "freedom as we know it"? What changes do you foresee?

m. The only certain thing about the future is change. Do you think we shall move toward the Soviet economic system? Discuss.

n. Read the last paragraph of the Leningrad letter again--aloud. Where do you agree or disagree in his condemnation of the U.S. Discuss his praise for the Soviet Union. How can he call it the "champion of peace and freedom"?

o. Do you think the people of the U.S. are satisfied with our present economic system? Defend your answer. Are the people of the Soviet Union really satisfied with theirs. Discuss.

A LETTER FROM LENINGRAD

Dear Friends and Comrades in America,

We in the Soviet Union wish you to know that our hearts go out to you in this time of national calamities. We know your problems and we sympathize. We read about them in our national press every day and we see them on our television. But believe me, Comrades, when I say these problems are a natural result of your decadent society and economic system. Perhaps there was a time for capitalism, I am not sure. But that time has passed, and in a world limited in resources, frozen to a single, minor planet, and surrounded by biological and economic absurdities, the socialist state is the world's only hope.

You are troubled by inflation at the same time that many people are unemployed. How can this be, you ask. Comrades, there is no such problem in the Soviet Union. We do not wait for supply and demand to balance out. *People* are the important thing in our society, not profit. If a man should love his job through technological change, he is immediately trained for another, and he is soon back making a valuable contribution to society again. Prices in the Soviet Union never get out of control. They are set by the government, based upon the value of the goods to society. We the people—the proletariat—own the land, the forests, the mineral resources, the steel mills, the auto plants—and *we* decide how they shall be used. The only cost worth considering is the labor and the working person is the sole beneficiary. I tell you, Comrades, your economic system is doomed because supply and demand can not much longer be manipulated by the capitalist employers for their own benefit.

You are plagued by pollution—water, air, land. Comrades, so long as you let the capitalist factory owners control the anti-pollution fight, you will never conquer the problem. Your great company—General Motors, what is the sole motive of the men who run the corporation?—Profit! Will installing costly anti-pollution equipment increase profit? Of course not! It will cut profits, and so they will bend every effort to avoid anti-pollution expenditures. They will procrastinate and rationalize, they will fight it out in the puppet courts, they will buy the votes of your elected officials. Our government assures us that the pollution fight is being won and as soon as new equipment is developed, it is installed. Cost means nothing. It is people who count!

Your newspapers talk only of Watergate these days. Friends, such a thing could not happen in the Soviet Union. The men who run for political office in your country are the tools of the capitalists. They win elections only with the financial support of the big institutions--Big Business, Big Unions, Big Organizations. Winning is all important and your politicans will do anything to win--lie, cheat, steal, spy. This is alien to my country. Here government candidates are carefully chosen by the Communist Party. We vote only for men who are honest, loyal, dedicated people. They believe in our communist system. They have nothing to gain by crookery. No one buys their vote. Their sole concern is the welfare of the people of the Soviet Union.

You have seen an oil shortage develop in your country, and soon, other shortages will appear. Comrades, you must expect this as long as your capitalist system continues. Consider your disgraceful waste in automobiles. For 50 years the capitalist manufacturers have made their autos obsolete with a year by changing the style annually, by making them rot away in two or three years, by waging giant advertising campaigns so that the poor worker is led into squandering his wages on new cars. Think of the tremendous waste of resources. And how those monster cars of yours guzzle gasoline. This too has been by design. How else can your huge monopolistic oil companies swell their profits? You have become a nation of wastrels! But I do not blame you, my American brothers. It is your capitalistic system that is to blame. Here, in the Soviet Union, we produce only goods that are necessary. We do not waste valubble resources on foolish gadgets, senseless trips, foolish playgrounds such as Disney World. Our resources of coal, oil, iron,,and countless others are virtually intact because we refuse to waste them on inconsequential items. Regretfully, I must tell you that some day soon--sooner than you think--you must pay the price of all this wastefulness. That price will be your "freedom"--at least, freedom as you know it.

When the history of the world is being written a thousand years hence, America will have an important place in history. You have given the world much. But you have destroyed as much as you have built; you have wasted as much as you have saved; you have desecrated as much as you have immortalized. The Soviet Union too will have an important place in history, for we shall be known as the saviors of the earth, rescuers of a decadent society, champions of peace and freedom.

With love and concern for the people of
America

Igor Ulanovich

Senior High Richard H. Willhite

International Trade Relations

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Each country has its own particular economic system, but all countries' economic systems are tied together through world markets of raw materials, food, and manufactured goods. Thus economic events that occur in one country affect other countries (i.e., crop failures).

3. Time: two hours - first hour - gaming simulation.
   second hour - analysis and discussion

4. Materials:

   a. Ditto masters and access to Ditto copier.
   b. Scissors.
   c. Shoebox or similar-sized container.
   d. Paper and pencil for each student
   e. Game overview:

   "It is the year 2001, and the world has been divided up into five countries. Each country has resources to sell to the other four, which each country requires to feed itself, furnish itself with manufactured goods and a government to manage these transactions.

   "A few years earlier, an inventor stumbled upon the design of the 'wigit', which has revolutionized world trade between the five countries. A wigit is a battery-powered machine that, when placed in a farmer's field, makes food crops grow three times as fast as without a wigit. More food can be grown in this way, but wigits won't work without "malodium" for their batteries. Only one of the five countries has a rich supply of this precious and rare metal.

   "Wigits have become very important since they were developed, but they are still hard to manufacture, and expensive to buyers. Each country either trades food it grows, makes wigits, repairs wigits, or trades the raw material for wigits to other countries, according to its needs and abilities."

   f. "Country" cards:

      (1). You are the ruler of Hunza. The people of Hunza are mostly poor, although farming land is rich and would be more productive if some way could be found to increase the crop yield per year, for Hunza cannot afford many wigits. Hunza is rich in "malodium" deposits, however, and barely manages to feed its people by selling the metal to countries that manufacture or repair wigits.

(2). You are the ruler of Bungo. Bungo's people are also poor, the farming land is not rich, and there are not enough people in Bungo to farm it anyway. Bungo does not even have enough malodium to trade for enough food to go around from those countries with a surplus of food to sell.

(3). You are the ruler of Lunawasi. This country has always been able to feed itself. They have no malodium, but most of Lunawasi's people now make a living by repairing worn-out wigit batteries.

(4). You are the ruler of Yoniland. Nearly everyone in Yoniland is prosperous. Yoniland manufactures nearly all of the wigits the world can buy. Yoniland does not, however, grow all the food it needs.

(5). You are the ruler of Lampto. Lampto is a country of intellectuals whose sole duty is to govern the trade relations of the other countries, besides governing itself. Lampto has no malodium, makes no wigits, and does not grow enough food to feed itself. The other countries pay Lampto for its good economic advice by giving it food and wigits. Lampto places final judgement upon the trade relations of the other countries and that judgement cannot be vetoed.

g. "Situation" cards:

(1). Someone in Bungo has found a substitute for wigits which is cheaper to build and makes crops grow even faster. They sell this to the other countries for more food for themselves.

(2). Someone else learns that this substitute for wigits can be made without malodium for its batteries.

(3). Crops fail world-wide, in the worst agricultural disaster of the century.

(4). Bungo and Hunza unite in a religious war against the other three countries. Trade between these two nations and the other three has stopped as a result.

h. Clock or watch.

5. Procedure:

a. Previous to the exercise, have sets of "country" cards typed, dittoed, and cut so that you have enough five-country sets to distribute to your class if it were to be divided into groups of five students each.

b. Also previous to the exercise, have "game overview" and "situation" cards typed, dittoed, and cut so that one of each could be given to each five-member group of your class.

c. Have each student write his or her name on equal-sized slips of paper suitable for a name drawing.

d. Place these slips in the shoebox.

e. Draw five names at a time from the shoebox so that the class is randomly divided into groups of five.

f. Distribute a "game overview" card to each of the five groups.

g. Distribute a set of "country cards" to each group, so that each group member gets a different "country card".

h. Explain to the students that either directly or indirectly, all countries trade food for wigits or wigits for food. As each class member is the ruler of one country, how would he negotiate with the other countries if the trade balance was upset?

i. Allow all groups 10 minutes to read, describe, and discuss their "overview" and "country" cards.

j. Pass out the first "situation" card to each group.

k. Fifteen minutes after the first "situation" card has been distributed, pass out the second.

l. Allow fifteen more minutes until the third "situation" card is distributed to the groups, and fifteen minutes after this before the final "situation" card is distributed.

6. Discussion Questions:

a. At first, how did the rich country leader feel?

b. How did it feel to be the ruler of a poor country at first?

c. If all countries traded food for wigits in some way, how was trade affected when someone in Bungo discovered a wigit substitute?

d. How was world trade affected when it was discovered that the substitute did not require "malodium"?

e. What would happen if the worldwide supply of "malodium" was exhausted before a wigit substitute was found?

f. What was the effect of a world-wide crop failure upon each country?

g. Which country would have felt the "pinch" first?

h. What was the effect upon the other three countries when Bungo and Hunza united in war against them?

i. Could any of the countries have been totally self-sufficient? How or why not?

j. Would self-sufficiency on the part of one country affected another country adversely? How or why not?

k. What is the purpose of this game?

l. Does this game have any analogies in the world of present-day international politics? How or why not?

m. How does a country that is always poor deal with its rich neighbors?

n. How does a country that is always rich deal with its poorer neighbors?

o. In the game, was it ever possible or a good thing to cut the governmental country off altogether? Why or why not?

p. What are some real world resource trade-relations between countries which could be viewed in a similar way to this game simulation?

Senior High James Seurnyck

Trade Balances

1. Concept to be developed: Economics and Technology

2. Understanding to be developed: Each country has its own particular economic system, but all countries' economic systems are tied together through world markets of raw materials, food, and manufactured goods. Thus economic events that occur in one country affect other countries (i.e. crop failures).

3. Time: 4 - 5 days

4. Materials: A resource center for necessary research.

5. Procedure:

   a. Take a manufactured item (car) and determine the raw materials used in the manufacturing process.

   b. Using chemistry, economic geology and other source books, determine which country is the source of the raw materials.

   c. Diagram the item being researched, identifying the raw materials and their sources.

   d. Give a brief report on the technology of production of raw materials.

6. Discussion questions:

   a. How important is foreign trade to our economy?

   b. What are the major imports and exports of our country?

   c. What is meant by a balance of trade and why is it important to our economy?

   d. What is the common market and how has it affected our economy?

   e. What are the political and social effects on countries who are the major suppliers of natural resources?

   f. Does economic stability have an effect on whether a country is recognized as a "world power" or not?

g. Who do you think should regulate prices of natural resources? Example: Mid-east oil.

h. Do you see a relationship between the stability of an ecosystem and its technological development? Explain, using two different countries as examples.

i. One of our major exports is wheat. How has inflation of our economy affected those countries that rely on us for this basic food?

7. References:

a. Next Hundred Years; Man's Natural and Technological Resources, by Brown, Harrison et. al., Viking, 1963.

b. Wood: World Trends and Prospects, by Food and Agriculture Organization.

c. Coal, by L. Hunter, International Publications Service, 1961.

d. Natural Resources for U.S. Growth; A Look Ahead to the Year 2000, by Hans Landsberg. Johns Hopkins Press, 1964.

e. Mineral Resources of the U.S., by E. Willard Miller, Rand McNally and Co., 1967.

f. Resources and Man, by Nat. Academy of Sciences. W. H. Freeman and Co., 1969.

g. Defense Against Famine, by A. V. Stack. Doubleday and Co. Inc., 1970.

h. New World of Aluminum, by E. B. Tracy. Dodd, Mead and Co., 1967.

Films:

a. Europa; 10 min. (ICF). Explains history of the concept "the common market".

b. Productivity: Key to America's Economic Growth, 20 min. EBF)

c. Food for a Modern World, 22 min. $7.50. U. of Mich.

d. Food Crisis, 60 min. b/w, $12.00. Indiana University.

Senior High

Richard H. Willhite

Ecological Trade-off Survey

1. Concept to be developed: Economics and Technology.

2. Understanding to be developed: Three major ecological trade-offs are 1) between population growth and environmental quality, 2) between levels of production and environmental qualtiy, and 3) between the degree of urbanization and environmental quality.

3. Time: Four days
   day 1 - preparation of questionnaire.
   day 2 & 3 - distribution and collection of questionnarie.
   day 4 - questionnaire-response analysis,discussion.

4. Materials:

   a. Ditto masters & ditto paper.
   b. Access to typewriter and ditto copying machine.
   c. Large sheet of poster paper.
   d. Paper and pencil for each student.
   e. A questionnaire designed to sample attitudes on population, production of consumer goods and urbanization, such as the following:

Environmental Attitudes Questionnaire

"This questionnaire was developed to help our class learn more about peoples' reactions to the environmental crisis. To assist us, please answer the following questions as sincerely as you can, based on the way each question or statement is worded.

The first two questions can be answered by entering a number in the blank spaces.

You can respond to the next eight statements by placing an 'x' above that number on the five-point scale which best represents your reaction to the statement. Although individual responses will remain anonymous, each class' average response to each question or statement will be posted after the questionnaires have been returned.

1. In my present family there are ____(number) children.
2. As an adult I would like to have _____(number children in my future family.
3. As an adult I would be willing to limit the number of children in my family to just two.

1	2	3	4	5
strongly agree	agree somewhat	neutral	disagree somewhat	strongly disagree

4. As an adult I would like to be able to afford a higher material standard of living than my own parents now have.

(scale)

5. In order to help alleviate environmental problems I would be willing to make sacrifices in the way I live, i.e., use car pools or mass-transit instead of drive a personal car to work, reduce the number of my electric appliances, etc.

(scale)

6. Future changes in the technology of producing consumer goods will probably eliminate most causes of pollution by the time I am an adult.

(scale)

7. I would rather live in the country than in the city as an adult.

(scale)

8. One good way to help alleviate environmental problems would be to allow the prices of goods to rise so that everyone consumes less energy and fewer resources.

(scale)

9. Everyone suffers from the effects of pollution to the same degree.

(scale)

10. I would be willing to pay higher prices for goods if they could be produced so as to have less negative effects upon environmental quality, i.e., "pollution free" cars, containers, electricity and other magical things.

Thank you for taking time to complete this questionnaire.

f. Table for posting questionnaire responses:

Environmental Attitudes of (your school's name)

Questions	1	2	3	4	5	6	7	8	9	10
Class A										
Class B										
Class C										
Etc.										
Average for entire sample										

g. Ink markers of different colors.
h. Shoebox or similar-sized container.
i. Scissors.

5. Procedure:

a. Develop with the students a questionnaire designed to sample attitudes about urbanization, or use the one suggested above in 4e.

b. Have this typed on a ditto master and duplicated in sufficient numbers to be distributed to as many classes in your school as you will have time to sample.

c. Have each student write his or her name on a strip of paper such as would suitable for a name-drawing.

d. Place the strips in the shoebox and by randomly drawing out names, divide the class into groups of three.

e. Obtain permission from other teachers for students in your class to distribute the questionnaires to students in their classes.

f. Have the students go in groups of three to the other classes in your school to explain the questionnaires, distribute them and collect them when complete. Ten minutes per class is sufficient.

g. Be sure to keep all the classes' questionnaires separate from those of other classes.

h. After all completed questionnaires have been collected and returned to your room, have the students calculate each class' average (mean) and then the entire sample's response to each question.

i. Post these on a table (such as shown under 4.f.) which the students have prepared on the sheet of poster paper for ease of reading, use a different color ink marker to post each class' average responses.

j. After discussing the responses, place the poster where everyone in the school can see it, along with a blank sample questionnaire.

6. Discussion questions:

a. On the basis of responses to questions 1 and 2, does it appear that the people you sampled desire more, fewer or the same number of children as are in their present families?

b. Does the difference between the numbers given in response to 1 and 2 vary with the grade levels of the classes you sampled?

c. How can you account for differences between the responses to 1 and 2?

d. Do the respondents generally seem willing or unwilling to limit their family size to two children (the replacement level)?

e. Does this willingness or unwillingness vary across class age levels? Why or why not?

f. How do answers to 4 and 5 compare? Are the answers in conflict with each other?

g. How is environmental quality affected by increased population and a general desire for a higher material standard of living (i.e., increased population)?

h. In the light of your answer to "g", how do you view responses to questions 2, 3, and 10? Are the responses in conflict or are they consistent with one another?

i. Since everyone rich or poor must have food, shelter and maintain adequate health, which income level suffers the most from overall price increases of these commodities?

j. In the light of your answer to "i", how do you interpret responses to questions 3 and 9?

k. Are responses to questions 4 and 5 in conflict or are they consistent with each other?

l. How did respondants tend to answer question 7? How can you account for such tendancies?

m. Are responses to questions 4 and 5 generally consistent with or in conflict with responses to question 7? Why or why not?

n. Is it possible for everyone who wants to, to "live in the country"? Why or why not?

o. What is the effect upon areas surrounding an urban center, when some people become able to "move to the country" while working in the city?

p. On the basis of the responses to the quettionnaires what guesses can you make about the way environmental quality is changed when populations grow?

q. How is environmental quality affected by widespread desires for increased material wealth?

r. Are people's reasons for wanting to live outside the city in conflict or consistent with the effects which their desired lifestyle will have upon environmental quality?

s. Is people's willingness to make personal sacrifices, as outlined in question 5, in conflict or consistent with their desires for a high-qualtiy environment? Why or why not?

t. How can you account for varying responses to question 6?

Senior High John L. Adams

Trade-offs

1. Concept to be developed: Economics and Technology.

2. Understanding to be developed: Three major ecological trade-offs are: 1.) between population growth and environmental quality, 2.) between levels of production and environmental quality, 3.) between the degree of urbanization and environmental quality.

3. Time: 1-2 class periods

4. Materials:

   1 chart, duplicated
   encyclopedias or other source books.

5. Procedure:

   a. On board list: 1.) Population Growth, 2.) Levels of Production, 3.) Degree of urbanization.

   b. Draw attention to the fact that each of these areas has a rate: i.e. growth, level, and degree.

   c. Suggest that each of these affects our environment, the effect depending not only on the rate, but also on the policies used in governing or controlling these areas.

   d. Divide class into thirds - each third assigned to one of the three areas listed on the board.

   e. Using encyclopedias, students are to look up the assigned area and read to find out the results of an increase in rate in each area.

   f. Groups can select a reader and have others take turns recording answers. Suggest that as the recorders are listening, if they think of a result not mentioned, they may list it.

   g. Pass out chart (rates and effects) 1 chart per group. Have each group fill in the area assigned to them.

   h. Each group selects one or two spokesman (men) to present its findings to the other two groups.

i. Someone compiles a master chart, filling in all three areas.

6. Discussion Questions:

    a. How is the concept of "more is better" a bad one?

    b. As society advanced, how did each area change in quality in relation to quantity?

    c. At what time in history, did these areas begin to snowball, or increase at a rate that was much greater than before.

    d. What evidence is there that things got out of hand? What? When?

    e. To prove that these areas are not isolated, briefly explain how each affects the other:

Population growth	levels of production
Population growth	degree of urbanization
Level of Production	degree of urbanization

7. References:

    a. The Hungry Planet, Georg Borgstrom, 1967.
    b. Circle of the World; Felanders, 1971.

1.) Population Growth		Effects of these on Ecology
little or none	great expansion	
2.) Levels of Production		
little or none	great level	
3.) Degree of Urbanization		
mostly rural	large cities.	

CONCEPT

ENVIRONMENTAL DECISIONS

UNDERSTANDINGS:

A. Lower Elementary (Kdg., 1st and 2nd)

1. To make a decision is to make a choice.
2. A decision can be made by one person or by a group of people such as a family or a class.

B. Middle Elementary (3rd and 4th)

1. Environmental decisions should be made only after considering all alternatives and the consequences of each alternative.
2. Your personal feelings and the feelings of others should be considered before you decide to act.

C. Upper Elementary (5th and 6th)

1. Many environmental decisions are made by consumers, governments, businesses, industries, clubs, and various community groups.
2. People working together with similar interests can often be more effective in influencing environmental decisions than individuals working alone.

D. Junior High (7th and 8th)

1. Making effective environmental decisions requires consideration of ecological, economic, political, social and technological aspects of the problem.
2. Effective environmental decision-making includes considering carefully the pros and cons of all possible alternative solutions, policies and actions, and studying the trade-offs among them.
3. Individual or personal decision-making involves one's feelings, attitudes, and values.

4. In many cases it is necessary to change the law in order to prevent environmental abuses.

E. Senior High (9th, 10th, 11th and 12th)

1. Decisions not carefully thought through frequently have unwanted results.
2. People most often affected by environmental abuses may be the least able to bring about effective action to correct them.
3. Environmental decisions should seek to improve the lives of people from all socio-economic classes.
4. Some people and organizations have more power to influence decisions than others.

Lower Elementary

Margaret O. Stockton

Outdoor School Beautification

1. CONCEPT: Environmental Decisions

2. UNDERSTANDING: To make a decision is to make a choice.

3. TIME: Two weeks.

4. MATERIALS NEEDED:

   a. 12"x18" drawing paper with an outline sketch of the school building.

   b. crayons

   c. pencils

   d. erasers

   e. chart paper

   f. catalogues of seeds and flowers

   g. scissors

   h. paste

5. PROCEDURE:

   a. Take the class on a field trip to the Dow Gardens.

   b. Based on field trip, list on chart paper all of the plants, flowers, etc. seen on the field trip.

   c. Go outside and tour the school grounds.

   d. Based on tour identify ways of improving the outside appearance of the elementary school. List these choices on the chart board, (i.e., trees, flowers trash containers, etc.).

   e. Go back outside, spread out, and with the 12"x18" sketched in school drawing have each child add their choice of way to beautify the site. Give each child the choice of drawing or pasting or both the flowers, trees, shrubs on to the drawing paper.

f. Return to the classroom and have a class discussion of ways that the building could be improved. Ask if any-one wishes to share their pictures an ideas.

g. Through out the class discussion, list on the chart board the ways to beautify the site, resource people to have speak, other field trips that might be taken that would help in doing this project.

h. Choose a way that you wish to work on improving the site.

i. This list will be sent to the principal and to the Title I Director for discussion, evaluation, and approval.

6. DISCUSSION QUESTIONS:

a. How can we improve the looks of our school building grounds?

b. What kind of soil do we have on our site?

c. What types of seeds would grow best?

d. How long would it take the seeds to grow?

e. For what period of time would these plants grow?

f. What can be planted so that there is a continuous cycle?

g. What can be planted for free, (i.e., state supplied, greenhouse, free donations)?

h. What would we need to purchase?

i. What would the approximate cost by?

j. Who will maintain our plants?

k. How can this beautification program be set up to be a continuous project from one year to another?

7. REFERENCES:

a. Department of Natural Resources

b. Greenhouse

c. Dow Gardens

d. Seed and Garden Catalogues

e. Science Co-ordinator

Lower Elementary

Glen Erickson

Choosing Before Deciding

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: To make a decision is to make a choice.

3. Time: 1 hour

4. Materials: Pencil and paper

5. Procedure:

   a. At the beginning of a week, explain to the class that they are going to write, draw, or discuss what they did over the weekend.

   b. Have the children draw pictures and/or write about 3 activities they did over the weekend that they decided to do themselves (they made the decision to do it).

   c. After each child has completed their drawing and/or description of the 3 activities, ask them to think about why they decided to do what they did. For instance, maybe one child decided to go to the nearby grocery store to buy some candy because his friends were going to the store too.

   d. Now have them add their reasons to their descriptions either by writing them down or emphasizing their reason(s) in their drawing. For instance, the child who went to the store could include his friends in the picture and have them pointing to the grocery store.

   e. After they have included their reasons in their descriptions, ask the children to list or include in their drawings all the possible activities they could have done instead of, for instance, going to the grocery store to buy candy.

   f. Now have the children share their experiences and their reasons and their possible choices they didn't choose with the rest of the class. The teacher could write or sketch different children's activities on the board and let the class see if they can come up with other possible activities the student might have chosen (considering money involved, whether other people were necessary to do activity, parental consent, desire, etc.).

   g. This activity could be used in other situations such as:

      (1). How did you get to school today and why?

      (2). What activities did the class do in the morning, and why did the teacher or the class or both decide on those activities over other possible activities?

(3). What did your class do during recess today? What choices did you have and why did you decide on doing what you did?

6. Discussion Questions:

a. Did you decide on doing what you did because your friends wanted to do it also?

b. Did you do something you have done many times before, or did you do something new?

c. Was money a reason for doing or not doing something? How was money a part of your decision?

d. Did you think of all the choices you listed, as things you could have done but didn't, when you decided to do what you did?

e. Example: Suppose a child decided by himself or herself to go to bed early. You might ask him:

(1). Were you tired?

(2). Was there nothing else to do, like watching television, playing a game, or helping someone do something?

(3). Were you planning on something the next morning that you wanted to get a lot of sleep for, like going somewhere exciting, school, or you just like to get up early even when you don't have something planned?

(4). Does any child ever decide to go to bed early without being told because they chose to?

f. Do you often, sometimes, almost never think about several things to do before you decide on one thing to do?

Early Elementary **Patricia McKnight**

Creating a Democratic Environment in the Classroom

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: A decision can be made by one person or by a group of people such as a family or a class.

3. Time: 4 days - day 1 - Discussion of school living situation; individual expectations and preferences of process.
   day 2 - Role playing of learning situations.
   day 3 - Play Common Squares and discuss reactions.
   day 4 - Discuss and then define process by group agreement for activities in the classroom.

4. Materials: chart paper, felt tip pens, Common Square puzzles, pencil, paper.

5. Procedure and Discussion Questions:
   a. Day 1. Questions to raise: Aim for increased self-awareness. The discussion goal is to decide how to live together.
      1) What do we do in first grade?
      2) What do you want to learn?
      3) How will this happen? Will we do it in groups, or one at a time with the teacher?
      4) Do you like to talk when you work?
      5) Do you like to have people talk to you?
      6) Do you care if you have to stop what you are doing?
      7) Do you like to be near someone when you are working, or would you rather be alone?
      8) If someone has a question or a problem, and the teacher is busy, what should he or she do?
      9) We all must share some of the same things in the room. How shall we use these?
      10) What should we do if we finish our work, and some others are still working?
   b. Day 2. Role playing in typical situation: You have drawn a picture and are ready to tell the teacher the story about the picture. Who would like to do this? Pick five children who will take the parts of a child in this situation. Choose another to be the teacher. Ask them to act out this situation.
      1) Questions to raise:
         a) How well did it go?
         b) How did you feel?
         c) Could you do what you wanted to do? Tell how. If not, tell why not.
         d) How did it make you feel? Did you get mad?
         e) How do you think it might work better, or was it all right this way?
      2) Now role play the same situation again with other children taking the parts. Point out before they begin that they and all of us may have learned something from watching the others that we didn't know before. After the second time, discuss results as before. Also ask, is it the same way we did things the first time? How is it different?

3) Using chart paper, write the suggestions the children have about how they would like to function in the classroom, and how they will share things we all use in common.

c. Day 3 - Play Common Squares. (described in Book 5, Skill Activities)
   1) Introduce the game. Tell the rules.
      No talking. No face or hand signs showing how you feel, what you want to do, or want them to do. You may not touch the other players' puzzle parts. All squares will be the same size when completed. Monitors can be the children who are left over after forming groups of five.
   2) Debrief. Questions may be:
      a) How did you feel?
      b) How did you feel when someone else finished first?
      c) Did you think that those who were stuck were dumb?
      d) When you were finished with your square, did you want to stop?
      e) What did most everyone in the square have to do before all the squares could be finished?
      f) Do we do anything like this with other things in the classroom?
      g) What did you learn about yourself?
   3) Read over with the children the things they dictated to you the previous day about how they wanted to live in the classroom. Do they want to make any changes? Any additions?

d. Day 4 - Review with the children what they have decided so far about how they want to function in the classroom (process) Then tell them you will write for them again the rules they want to follow. Urge them to make as few as possible, and help them to generalize if necessary. This can be done by asking them questions when they repeat procedures. Post them where they think they will be the most useful. It is valuable, and satisfying to them to ask someone each day to read the procedures to the class when work is about to begin.
   1) Culminating questions: These are to help the children understand clearly the process they have evolved, and the reasons for it
      a) You have decided some ways to act when we work together. Does it work best for each of us to decide how to work for himself, or to decide together how to work and live together?
      b) Why do you think so?
      c) What about the things we share? How do you feel about it the way you chose to use these?

6. Follow-up Activities.
   a. Using the same procedure, ask them to create rules for using the playground and equipment. Remind them of possible situations such as: choosing teams, wanting the same toy, getting hurt, etc.
   b. Again using the same process, they can decide how to accomodate visitors in the classroom. (Role playing is good here)

7. Reference:
   Values and Teaching, Louis E. Raths, Merrill Harmin, Sidney B. Simon, 1966, Charles E. Merrill Publishing Co., Columbus, Ohio.

Lower Elementary

Margaret O. Stockton

Indoor School Beautification

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: A decision can be made by one person or by a group of people such as a family or class.

3. Time: One week.

4. Materials:

    a. Manuscript paper
    b. Pencils and erasers
    c. Chart paper
    d. Barrel (trash)
    e. Enamel paint
    f. Sponges
    g. Paint remover

5. Procedure:

    a. Tour the inside of the school building, halls, bathrooms.

    b. Based on the tour identify ways of improving the inside appearance of the elementary school.

    c. List ways that the class can improve the inside appearance.

    d. Choose two ways that the class together could improve the general inside appearance.

    e. Send the two choices to the principal for discussion, evaluation, and approval.

6. Discussion Questions:

    a. How can we improve the appearance inside of the elementary building?

    b. What would be some projects that would best serve the entire school?

    c. What would be needed to do this project?

    d. What would the project cost?

    e. How would we go about obtaining the materials?

    f. Who would maintain the project?

    g. Who was the decision-maker for the project? Could you have made that decision all by yourself? Why did we have to take our plan to the principal?

Middle Elementary

Maryanna Baldwin
Marilyn Masouredis

Land and How the People Want to Use It

1. Concept to be developed: Environmental Decisions.

2. Understanding to be developed: Environmental decisions should be made only after considering all alternatives and the consequences of each alternative.

3. Time: 4 days - day 1 - Select committees and discuss needs
   day 2-3 - Presentations
   day 4 - Boards decisions and why

4. Materials:

   Pencils and paper
   Newsprint, felt pens, and rulers
   Specific areas for group discussions and work

5. Procedure:

   a. Present the class with the problem of a specific tract of land and its possible development by the community. This land encompasses a virgin forest, small lake, meandering river, and evidence of wild life.

   b. Have the children volunteer for one of the following interest groups:

      industry
      commercial
      shopping mall
      recreational
      environmental
      residential

   c. Explain that this is a make-believe situation. Our tract of land cannot accommodate development by all the interest groups, just one. A board of four will be elected by the class to decide on the issues and arguments presented by the interest groups. The teacher can sit and vote on this board also.

   d. Have the class elect the board of four. The board can in turn select a chairman. Each board member should be responsible for his own note taking. After the board has been elected give the students on the board a choice of occupation. List some examples: doctor, judge, teacher, retiree, accountant, journalist, salesman, dentist, business man, etc.
   After making an occupational choice instruct the students to think in that way.

e. Each interest group should go to their work areas to discuss reasons for including their particular area of interest They should choose a spokesman and secretary to list their arguments. Allow about fifteen minutes for this.

f. The spokesman for each interest group should present their facts to the board.

g. When each group has finished presenting their facts the board should spend about fifteen minutes deliberating the facts. Each member of the board can vote for only one of the interest groups.

6. Discussion Questions:

a. What opinions do you have on the presentations of the other groups? Do you think that they had good reasons for wanting their interests included?

b. Following the board's decision, what will some of the consequences be in regard to:

1. How many people will benefit from the use of the land?
2. What natural resources will need to be used in order to develop the land?
3. How may the use of the land effect the population of the community?
4. Will the use of the land create new jobs for people?
5. In what ways will the development of the land effect the wildlife in the area?
6. Can you picture what this plot of land will be like five years from now?

Middle Elementary

Glen Erickson

Environmental Community Planning

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Environmental decisions should be made only after considering all alternatives and the consequences of each alternative.

3. Time: 1 week.

4. Materials: Introductory remarks: If you have access to the Coca-Cola game, "Build Your Own World", play that first with your class. It is a good game to start the students thinking about decisions and their consequences. Then have the class build their own community on large paper, or even a model. If you can't play the Coca-Cola game, you still can do this activity, but it helps if they have the opportunity to play "Build Your Own World".

    a. Large paper (rolled paper is fine)
    b. Pencils, colored pencils, crayons, or paint
    c. Blackboard

5. Procedure:

    a. Explain to the class that they are going to plan a community of their own.

    b. All the decisions involved in planning the community will be made by the class.

    c. Have the class suggest different groups of people that will be in their community, such as:

        (1). Farmers
        (2). Businessmen
        (3). Labor - construction workers, factory workers, etc.
        (4). City Council
        (5). School children
        (6). Senior citizens
        (7). Large industry
        (8). People interested in preserving and protecting wildlife
        (9). City Departments: Sewage Treatment, Parks and Recreation, etc.

    d. Have the class divide into interest groups based upon their suggestions.

    e. Have each group decide on things that they feel are important to have in their community. For example:

(1). Labor — We want factories to work in, an expressway to build, providing many jobs for the community. We don't care too much about how our constructions and factories hurt the environment because we need jobs to live.

(2). School children — We want parks to play in, streams and lakes to swim in, and wildlife to see.

f. After each group has decided on the things that they most want to see in their community, have the class together decide upon specific items they want to consider putting in their community. This part of the activity should be used to bring out any and all items the class can think of that could be included in their community. Deciding upon what things the class actually wants, and their locations will be done later in the activity.

g. Now have the class decide which items they feel are the most important (from their suggestions in part f) to decide upon. For example: the class might suggest having a zoo, and an amusement park, but decide that of those two items only the zoo will be seriously considered and voted upon.

h. After the class has decided upon the most important items (new items can be considered later on, if forgotten or first thought to be unimportant), list these items on the board and begin to decide by voting, whether the item should be included in their community, or not. Each interest group should represent their particular interest in the discussions. If a student feels that something wasn't brought up by the group interested in that area, he should voice his own concern after all the other groups have been heard.

i. By voting, the class now decides whether or not to include each specific item. The class should decide before voting how the procedure for voting should take place, such as: a simple majority of the class decides the vote, or two-thirds of the class must approve of an item before it will become part of their community.

j. Once the voting is completed on what items will be put in their community, the location of each item must be decided upon.

k. Take each item separately and after each interest group speaks out concerning where the item should be placed, another vote should be conducted, finally arriving at a final location for an item.

l. When the location has been decided for a particular item, place the item on your large picture or model of the community. This map can be drawn on the board, on large paper, or as a model. It should include many of the areas that your community has. For instance: rivers, lakes, woods, downtown business district, farmland, residential areas. Leave out the specific items that will be voted upon, only including them if they are approved by the class.

m. Continue this procedure for the remaining items to be voted upon until you have finished planning your community.

6. Discussion Questions:

a. Did your class decide to place all the suggested items in your plan?

b. What items conflicted with each other, such as: expressway construction and open space (parks, fields, woods, streams, etc)?

c. Did you find that many items were voted upon in favor of one or two groups?

d. What were the most important reasons for the voting outcomes? Did most of the decisions revolve around certain reasons, like: increasing industrial growth, progress, making more jobs, the need for open areas, convenience, recreation?

e. What conflicts of interest groups occurred in the voting sessions?

f. What similarities does your plan have with your own community?

g. Did your class decide the same way your community has, about which items to include and their locations?

h. Did you feel that your class planned your model in a better way than your community has? What factors (environmental concerns, social concerns, considering everybody's feelings and needs, etc.) did your class consider more thoroughly than it appears your own community has?

i. Is it possible to reach agreements or compromises that seem to benefit everyone in some way? If so, how did your class reach your agreements?

j. Did every group and every individual student have an equal voice in making the planning decisions?

k. Were long-range consequences of placing certain items in your planned community considered, especially in light of other alternatives?

Middle Elementary

Glen Erickson

How Do You Feel?

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Your personal feelings and the feelings of others should be considered before you decide to act.

3. Time: 1 - 2 hours

4. Materials: Introductory remarks: People's feelings play a large part in their decisions and in decisions that directly affect them. When decisions are made without considering everyone's feelings, the results often benefit only a few people. This activity is designed to help the students identify their own feelings, recognize other people's feelings, and involve both these sets of feelings in making more just decisions.

   a. Blackboard or ditto
   b. Pens and paper

5. Procedure:

   a. Either write on the blackboard or on a ditto a series of questions such as:

      (1). Would you like to go to an amusement park and ride on a ferris wheel?

      (2). Would you like to walk around one day blindfolded?

      (3). Suppose your class all goes to a store, and half of the class is given 25 cents to spend, and the other half is given 5 cents apiece to spend. You are one of the students who is given 25 cents to spend. What would you do with your 25 cents?

   b. Now have the students respond to the questions by writing their answers on a piece of paper or on a ditto. Follow this by sharing out different student's decisions and their reasons.

   c. Write on the board the following format for deciding on the following situations:

      (1). I would like to do this. + 2 points
      (2). I would agree to do this. + 1 point
      (3). I would rather not do this. - 1 point

   Each of the following situations should be decided upon by scoring all of the children's responses by giving 2 points for each #1 response, 1 point for each #2 response, and take away 1 point for each #3 response. Add up all the scores together and see how most of the children feel.

d. Hopefully you can adjust each question to a real situation in your class, so that the students actually make decisions based upon everyone's feelings. Some students won't agree with the majority of the class and it is important that their feelings help determine any final decisions. Many decisions can directly benefit most of the class and yet still be adjusted to benefit, in possibly a smaller way, other students not initially agreeable to the decision formed by most of the class.

e. For each of the following questions, have the class suggest alternatives to consider, and then vote on these alternatives using the scoring system described. Try to adjust each decision to, in some way, be favorable, interesting, and valuable for everyone.

(1). Where should our class go for a field trip (walking, car pooling, buses)? And what should we do on the field trip?

(2). What types of fund raising projects could we do to raise money for school site plantings? What should we buy with our money when we raise it?

(3). What classroom activities or subjects should our class work on next?

(4). What people in the community would you like to invite to come and speak to our class?

(5). What classroom presentations (assemblies, for other classrooms) would we like to do? Which are most appropriate for our class at a certain time like: Christmas, Fall, Spring, Earth Week, etc.?

f. Make up other questions yourself or have the class suggest other issues to decide on in class.

6. Discussion Questions:

a. How do you feel when a group, of which you are a member, decides to do something without listening to or considering your feelings before deciding?

b. Do you think more people feel good about decisions if they are made in a similar way to the way your class decided on the issues in this activity?

c. Do you feel comfortable in expressing your feelings about a particular issue in your class? If not, what things hinder you in expressing yourself, and how do you think the situation could be improved?

d. What decisions do you recognize in your community that weren't made by considering all or most people's feelings? How do these decisions benefit some people much more than other people, and even turn out unfavorable for some people?

e. Do you feel that our government representatives (Senators, Congressmen, City Council, etc.) keep in touch with the feelings of the people they speak for? How might people, like yourselves, help your representatives keep in closer touch with your feelings, and the people around you?

Middle Elementary

Marilyn Masouredis

Animal Puppets, People, and Rights

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Your personal feelings and the feelings of others should be considered before you decide to act.

3. Time: 3 days - day 1 - make puppets
   day 2 - puppet show
   day 3 - discussion

4. Materials: Old but clean well darned socks.
   Buttons, felt pieces, cotton, odds and ends, needles and thread.
   Very large box, paint, glue, twigs, clay, string, cardboard, and construction paper.

5. Procedure:

   a. The children are going to put on impromptu hand puppet shows involving people animals and their habitat.

   b. They can select any puppet character they wish to make. The following list is an example:

      Deer
      Chipmunk
      Squirrel
      Fish
      Man

      Rabbit
      Beaver
      Bird (any kind)
      Frog
      Etc.

   c. Give a short demonstration on how to thread a needle, knot the thread, sew on the necessary pieces and identifying characteristics that will construct characters. For example, a rabbit has long pointed ears, a squirrel has a bushy tail, etc.

   d. The stage can be a large box with the front and back removed. Paint the sides, top, and bottom with an outdoor scene. With paper, clay, twings, string, sponge, and glue create some trees and shrubs. A curtain can close the back of the box so that the performers can conceal themselves except for their hands which will support the hand puppets.

e. The children can put on several impromptu plays with this stage and these puppets. Before each production they are given a situation involving a change and an alteration in the environment. They should select the puppet characters needed for that particular situation. For example:

Situation	Characters
Sewage dumped into a fresh water pond.	Man, fish, frogs, beaver
Wooded area stripped for housing development.	Man, birds, squirrels, deer, chipmunks, rabbits, beaver
Wooded area cleared for farming.	Man, squirrels, etc.

Have the children present some situations.

6. Discussion Questions:

a. When a change took place in one of our situations (name a specific play) who was effected by it? Were all our characters helped by the change? Who was helped and who was not helped?

b. Is it possible to make changes in the environment and make everyone happy?

c. How can man continue to dispose of his waste, and feed, cloth and shelter himself with the least amount of disruption to his environment?.

Upper Elementary

Glen Erickson

School and City Government

1. Concept to be developed: Environmental Decisions.

2. Understanding to be developed: Many environmental decisions are made by consumers, governments, businesses, industries, clubs, and various community groups.

3. Time: One to two weeks.

4. Materials: Telephone Directory, telephone, letter writing materials, access to a Public Library.

5. Procedure:

   a. Draw an organizational plan (flow chart) for the school's administration.

      1) Trace the decision making process from the classroom to the principal.

      2) Trace this process from the school to the school system administration.

      3) Place on the flow chart the various clubs and organizations, custodians, parents, etc. that participate in the school's operations.

   b. Make another chart or organizational plan for the city, (county, state, etc.) administration, including the chart for the school system in this larger plan.

      1) Discuss with the class the different departments, divisions, boards or commissions, and the City Manager and Mayor, to get some idea of as to the kinds of questions and misinformation, that the students have.

      2) Have a City Councilman or Councilwoman come to the class to explain what they do in the organization. If a visit is not possible, ask your questions by writing a letter.

      3) Chart this new information on the organizational plan.

   c. From the information gathered from the students in activity #2, set up small (no more than five students) groups to find answers to certain questions raised by the class.

      1) Each group may write letters, make telephone calls, invite people to talk with the class, talk with their teacher, or use printed (newspapers, booklets, charts, etc.—obtainable from the library) material.

2) All groups should report their findings to the whole class.

3) The groups should be arranged to explore different parts of the city's government:

    a) City Council

    b) Commissions and divisions

    c) Boards (i.e. Pollution Control Board, Public Health, etc)

    d) Clubs (consult yellow pages of Telephone Directory under "clubs", for those which may be interested and helpful in your activity. There are service clubs, sports clubs, union clubs, and private clubs).

    e) Chamber of Commerce - (business, and industries).

    f) Political Parties.

    g) Leagues - (i.e. Junior League, League of Women Voters).

    h) Any other groups that play a role in your city's government, such as Consumer groups, Ecology Center, etc.

d. The information gathered from each group about the functioning of the city's government should be placed on the organizational chart.

e. Field trips to any of the various organizations would help complete your chart.

6. Discussion Questions:

a. Who runs the school? If the answer comes back, "the principal," then ask, "does he (or she) run the school alone?"

b. Where do students fit into the decision-making in your school?

c. Do parents have a say in the operation of your school? Does the custodian have a say? If so, how do they involve themselves in making decisions about the school?

d. Do groups of students, or clubs have the same or greater effect on the decisions and operation of your school?

e. Who runs the city (county, state, school system, etc.)? If the answer comes back, "the Mayor", then ask, "does he or she run the city alone?" If the answer is "City Council", then ask, "are they the only ones?"

f. Does your city have ordinances for air pollution, water pollution, noise pollution?

g. How does zoning work?

h. What are millages and millage elections? How do they affect the operation of the school system, and, in particular, your own school?

i. What role do newspapers and television play in the running of your city? How can you, as an individual, or as a group voice your concerns? Through newspapers and television?

j. Do political parties play a part in city government?

k. How do businesses and industries affect or determine the operation of your city government?

l. Does your city have a Planning Commission? If so, how might you become involved in their role?

Upper Elementary

Darrell Donelson

Why That Decision?

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Many environmental decisions are made by consumers, governments, businesses, industries, clubs, and various community groups.

3. Time: 5 days - day 1 - Discuss understanding to be developed. Plan field-trip to local industrial (or other) plant.
   day 2 - field trip
   day 3 - Compile data, draw charts.
   day 4 - Discuss conclusions drawn concerning this particular plant.

   Homework: have students research area - writing down any apparent environmental considerations that went into the layout of neighborhood streets, city planning, industrial parks, etc.

   day 5 - Compile and discuss data collected. Draw conclusions as to the way various segments of our community are handling the understanding we have developed. Decide what future actions we might be able to undertake.

4. Materials:

   Pencils/pens
   Note Pads
   Industrial or Commercial site for field trip
   Tour Guide (knowledgeable in our area)
   Construction Paper/Poster Board
   Magic Markers
   Empty Wall Space

5. Procedure:

   a. Discuss understanding to be developed.

   b. Plan trip to applicable industrial, commercial, or governmental site.

   c. Pre-plan some of the questions students will ask the tour guide.

d. Field trip to selected site.

e. Compile data gathered and draw charts showing what environmental decisions the people considered when planning and doing their particular work.

SAMPLE CARDS

ROMA BAKERY

Environmental Decision: To have cleaner grounds and good waste control.
Action: Installed more outside waste receptacles adequate for their wastes and patronizers of bakery.

ROMA BAKERY

Environmental Decision: To cut down on early morning neighborhood noise.
Action: Now have truckers use alternate route. Fewer homes on that road.

ROMA BAKERY

Environmental Decision: Promote neighborhood clean-up campaign.
Action: Bought Advertising time on local radio station stating day and time of campaign.

f. Not all data is expected to be of good decisions. If class feels wrong decisions were made they should state these along with what they consider the right decisions.

g. Draw conclusions on how effective we feel the particular place we visited is doing in various areas of environmental decision making.

ROMA BAKERY

	Very Good	Good	Fair	Poor	Very Poor
General Appearance					
Interior Appearance					
Exterior Appearance					
Grounds Appearance					
Window Display (Clutter)					
Noise Level (General)					
Aroma Emitted					
Community Involvement					
Waste Control					
Other					
Overal Environmental Concern					

h. Have students research area and fill in to the best of their knowledge charts on neighborhood buildings and the community in general.

i. Compile and chart data brought in by students,

j. Draw conclusions as to the overall environmental concern shown by the community.

k. Discuss the right and wrong environmental decisions made by the community and commercial concerns within it.

l. Plan where to go from here. Also, what should be done with the compiled data.

m. An alternative approach would be for the child as a consumer to appraise the environmental decisions he makes in buying particular products.

Examples: RETURNABLE/UNRETURNABLE BOTTLES
COLD WATER/HOT WATER DETERGENTS
BIODEGRADEABLE/NON-BIODEGRADEABLE

6. Discussion Questions:

a. Are environmental concerns involved in many decisions we make? Name some.

b. Is environment involved in decisions made by consumers, government, business, industry, and consumer groups? Name some.

c. Are there places in our community you feel have followed a strict environmental ethic in making decisions? Which places? What decisions?

d. Would you like to visit ______________________?

e. What should we look for and what questions should we ask on our field trip?

f. What data have you collected on our trip?

g. What type of environmental decision making was involved in the data we collected?

h. Can we compile and chart the collected data?

i. Do you feel the place we visited has a sound environmental ethic? Why or why not?

j. Are there other places in your immediate neighborhood that we can chart?

k. How did the places you observed compare with our field trip visitation?

l. What conclusions can we draw about the overall environmental ethics and decisions being made by our community?

m. Where do we go from here?

7. References:

None needed - Major concern should be pre-planning involved with your tour guide. He should be told what your goals are in having the field trip. He can then place most emphasis on environmental decisions they have made and why they made them.

Upper Elementary

Nancy Rhodes
Marilyn Ryder
Gail Agne

Effects of Group Pressure

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: People working together with similar interests can often be more effective in influencing environmental decisions than individuals working alone.

3. Time: 1 day

4. Materials: Copy of value related statements for each student:

   1. Anyone who litters should pay a stiff fine.
   2. Cigarette smoking is allright for people who enjoy it.
   3. Snowmobiles should not be allowed on any public land.
   4. School should be operated year round to save energy.
   5. People should never use air conditioners in the summer because they waste energy.
   6. All students should have a say in deciding school rules.
   7. People who smoke are bothering people who don't smoke and should be made to smoke in a separate area.
   8. It is the job of the students and teachers to keep their school playground looking nice and clean.

5. Procedure:

   a. Distribute copy of statements to each student.

   b. Students decide whether they agree or disagree and mark their papers accordingly.

   c. Students are divided into groups to air their feelings about each question.

   d. Students should discuss their answers and the reasons for them. They should attempt to convince each other that their own opinion is correct.

   e. After all questions have been discussed, have students re-vote to see if their opinions have changed.

6. Discussion Questions:

   a. Did your opinion change after you talked with your group? Why or why not?

   b. If you were the only one with your opinion in your group, how did you feel?

   c. If you were one of several in your group with the same opinion, how did you feel?

   d. Given an environmental problem such as a factory putting too much waste into a river, who do you think would have a better chance of making a change, an individual or group? Why?

Upper Elementary

Glen Erickson

Helping Litter Find a Better Home

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: People working together with similar interests can often be more effective in influencing environmental decisions than individuals working alone.

3. Time: 1-2 weeks.

4. Materials: Blackboard, chalk, typewrite, dittomaster or stencil, telephone, Telephone Directory.

Introductory Remarks: This activity requires good planning, aimed at creating greater involvement and committment in the school and in the community. The activity can be broken down into five separate steps:

a. Developing a permission slip for field-trip

b. Developing a checklist for types of litter

c. Developing an Interview form

d. Developing a Litter Data report

e. Developing a plan of action and carrying that plan out

5. Procedure:

a. Developing a permission slip for field trip:

1) Community relations are very important in any school-community activity, and informing parents through the permission slip, especially if it is designed by the children, is an excellent way to inform and involve parents.

2) Present the class with the idea of taking a clean-up field trip. The class should suggest various things to include in their permission slip such as:

---purpose of trip
---date of trip
---place for parent's name
---destination of the trip
---date by which permission is needed in order to construct a role of attendees
---place for child's name, and teacher's name

3) One group of student's can design the slip, with suggestions and approval from the rest of the class.

b. Developing a checklist for types of litter:

1) Explain to the class that information can be collected in many ways:

---observation and interviews
---recording and classifying (grouping) information
---defining the problem

2) Have the class suggest items they want to place on their checklist:

---types of litter
---places where litter is found
---different kinds of litter
---kinds of animals observed (rats, squarrels, mice, etc.)

3) One or more groups of students can then design the checklist, again relying on the whole class for suggestions and approval.

4) After the checklist is completed, have the students all complete their own checklist by visiting a location where litter is present, and recording their observations (Several locations should be surveyed, so that one or more areas can then be selected for the final phase of actual clean-up).

c. Developing an Interview form:

1) Discuss with class the importance of finding out what other people feel are problems and their ideas for involvement and solution.

2) List on the board, as with steps "a" and "b", suggestions for an Interview form:

---Do you think the streets are clean enough?
---Do you think the parks and playgrounds are clean enough?
---What area do you think needs cleaning up the most?
---What do you think should be done about it?
---Will you help my class clean it up?
---What do you think we can get other students involved?
---What local organizations or agencies might cooperate in our clean-up campaign?
---(Garden Club, P.T.A., individual parents, City, Ecology Center, etc.)

3) Have one or more groups of students design the final form for everyone to use.

4) Have each student fill out several forms by going to other classrooms, and also to parents.

d. Developing a Litter Data report:

1) After completing the checklists, taking one or maybe two days to finish, tabulate the results.

2) From this accumulated data, have the class decide on the specific area or areas to be cleaned up, as well as, who else to involve (besides your class) and the best ways of getting involvement.

e. Developing a plan of action and carrying that plan out:

1) The plan should be constructed using the information gathered throughout this whole-activity.

2) Basic plans should include such things as:

---How much time can be spent on the clean-up?
---Number of people involved
---What will the litter be placed in, and who will be in charge of obtaining the containers?
---What tools, if any, will be needed, and who will be in charge of getting them?
---What organizations and agencies should be contacted, and who will be in charge of that?
---How will the litter be disposed of?
---Publicity from local newspapers, radio, and television
---If area is privately owned, has permission from owner been obtained?
---When will clean-up take place?

3) Litter bags or receptacles can probably be obtained either through the City Department of Public Works (D.P.W.) or through the school system's maintenance department, or local organizations like the Garden Club.

4) Disposal of the litter can be taken care of either through the D.P.W. or through the aid of parents with trucks.

5) Civic groups (Jaycees, etc.) might help in recycling glass, if a recycling center is close by.

6) Carry out the clean-up campaign.

6. Discussion Questions:

a. What did we as a class accomplish?
b. Could any one person gather this information as well?
c. Who has more impact, a large group or one person.

7. References:

a. Environmental Learning Experiences: for Grades Five and Six. Ohio Department of Education, 1973.

Junior High Glen Erickson

Expressway Construction-Paving the Wave for Progess?

1. Concept to be developed: Environmental Decisions.

2. Understanding to be developed: Making effective environmental decisions requires consideration of ecological, economic, political and social and technological aspects of the problem.

3. Time: Two class periods.

4. Materials: Introductory remarks: The City Planning Commission has joined forces with the Federal Government to construct an expressway through the middle of the community. This community lies almost directly between a nearby metropolis and several large State owned recreational areas. The community has a population of 100,000, with the metropolis having 2 million people. The community has a central, urban core, along with a growing suburban district, surrounded by fertile farmlands. In class, we will simulate a planning session, in which, various interest groups will represent their positions in an attempt to:

   a. Approve the proposed plan.
   b. Recommend an alternative plan or route.
   c. Decide against any expressway construction.

   Position statements: These should be on large index cards.

   a. Displaced resident - The proposed plan places the expressway directly through my neighborhood forcing me to leave my home and move somewhere else. Wherever I move will be much farther from my job. My children will have to leave their school and friends. I won't be able to find another house to buy, with my present income, and will have to move into Public Housing, or rent an apartment.

   b. Dairy Farmer - The proposed plan for the expressway will go through one-half of my farm. My dairy herd will have to be reduced in half because of the loss of pastureland. I am told by other dairy farmers that my remaining cows will produce less milk because of the constant noise from the neighboring expressway. I don't think I can make it anymore as a farmer, with only one-half of my herd remaining. I feel all I can do is to sell my land to developers for a new shopping center. I enjoy being a farmer, and now, although I will receive a good price for my land from the developers, I can no longer farm and must look for another kind of job. I used to enjoy relaxing on my front porch under the large oak tree in my yard. The power company has informed me they must cut my tree down to put their power lines through to the proposed apartment complex that will be built alongside the new expressway. My oldest son will soon be graduating from the University's Agricultural School, and was planning to take over the farm in a few years, to keep the farm going like it has now for 100 years. I used to like the quiet, easy-going life on my farm, but I guess that is all in the past.

c. City Businessman - This new expressway is just what I've been waiting for. My downtown business will surely increase with more people coming downtown on the new expressway. I should also get more business from metropolitan people coming through on weekends, as they head for the State recreational areas beyond our city. I can now think of expanding my business, and placing another outlet on one of the new proposed shopping centers that will be serviced by the expressway.

d. City Council - We feel that the new expressway will be a huge economic boom to our community. People will be able to move much easier through the city, allowing people in suburban areas a quicker way to get to the downtown business district. The construction will provide many more jobs for the people in our community and will pave the way to more progress, more industrial growth, and more business from the neighboring metropolis. Our community needs this link to other communities to keep it alive and growing. Without it we will continue to remain isolated from the mainstream of our progressing society.

e. Resident Living Alongside Expressway - The new expressway will be placed directly alongside my home. I have heard that the noise from the constant traffic might keep my family awake at night. My job is only a short, five minute drive from my home now, because I can travel on little-trafficked residential streets. I understand that with the proposed expressway my normal route will be blocked off, forcing me to use the expressway to get to work. I imagine during rush hours it might take me 20-30 minutes to travel to work. My children would have to cross over the expressway to get to school and I am worried about their safety. The street in front of my house is planned to be widened to four lanes to link up with the expressway. I think many of my neighbors will be moving away, as I see many FOR SALE signs in the neighborhood already. I like my home and do not want to move, but I am concerned about living so close to an expressway.

f. Construction Worker - Working on the expressway construction will mean a steady, high-paying job for me for several years. Maybe now I can start thinking about buying my own home. The expressway should lead to more construction in our community, which would allow me to maybe start a small construction firm of my own in the near future. I don't care where the expressway will be built, as long as it is built.

g. School Child - My parents tell me that the new expressway is planned to go right through the big woods and pond next to the school. I go there often for school field trips and also alone, or with my friends to walk in the woods, look at animals, go fishing, and to just sit in a nice quiet place. I even have a special place of my own where I go when I want to be alone. I don't understand why they have to build a road through my woods. No one ever asked me if I wanted it; and I don't.

h. Corner Grocery Store Owner - I am going to have to sell my business if the expressway comes through because many of my customers will be shopping at the large chain-grocery store that they can get to quickly by the expressway. I've run this store for 25 years and I have many regular customers who depend on my store to buy their food. Many of the older folks in this neighborhood can't afford to drive to the shopping centers, but I know I can't stay in busines with only my regular customers. I need the customers that will be going to the larger stores that they can reach more easily by the expressway, then they could before. I won't be able to compete. Maybe I can get a job in one of those chain-stores on the shopping centers, but I'm 55 years old and they might not want to hire me.

i. Environmental Citizen Group - We feel that the proposed plan of building the expressway through our city will cause many serious problems. Just look at other cities that have done the same. Their housing situation became critical, with the expressway going through the heart of the low-income housing. These people then can't find another home they can afford, and must rent or receive assistance from the local or Federal government for housing. The plan for the new expressway in our community will also destroy several city parks and many wood lots and fields that add so much to our city's environment. We are very concerned about the pressure to induce more growth in orr community, to keep pace with other cities. Our city has a unique character of its own and we are afraid of losing that by placing an expressway through the middle of our city. We propose another plan for re-routing the expressway around the immediate city and preserving the quality of our community environment.

5. Procedure:

a. Introductory remarks should be read or noted on board.

b. Ask for volunteers or pick ten students who will be representing their interests - 1 moderator, 9 spokesmen.

c. Divide the remaining class into groups centered around each of the nine spokesmen to explore other reasons (in addition to those already on the position caris) to support the particular spokesmen's position.

d. Reassemble the class after 15 minutes of group discussion and have the spokesmen each state their position, formed from the position statement and any suggestions from the group discussion. This part of the activity could be completed in the first class period.

e. The following class period should open, once again, with the spokesmen stating their positions to the rest of the class.

f. Class discussion should follow to determine which policy they feel is best. Voting could take place to make a final decision.

g. The class may wish to extend their discussion from this simulation to their own community.

6. Discussion questions:

a. Who do you feel real-world planning, like with this issue, normally benefits? Was this the case with your planning session?

b. Does a decision to build a major expressway in a community lead inevitably to expanded growth? Is this a good thing for most communities?

c. What external costs does major construction place on a community? Who pays these external costs (as opposed to direct financial costs for actual construction)?

d. When should planning for major constructions be started? 1 year, 2 years, 5 years, etc. before construction?

e. Does your community have a major expressway running through or around it? If so, what types of planning do you think took place?

1. Who benefitted most from its construction?
2. Who benefitted the least?
3. What environmental problems do you observe that are directly related to the expressway?

f. If your community doesn't presently have an expressway in or around it, do you expect one to be built soon? What environmental considerations do you feel a new expressway in your community should take into account?

g. What suggestions do you have concerning the actual construction and technology of an expressway, such as, use of medians, entrances, and exits, and location?

Junior High Pat Baron

Returnable or Throw-Away Bottles

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Making effective environmental decisions requires consideration of ecological, economic, political and social and technological aspects of the problem.

3. Time: one week

4. Materials: Room for storing bottles
   Charts (6) -- 1. bottle collection data
   2. glass manufacture
   3. economic influences
   4. political pressures
   5. negative and positive social implications
   6. technological developments
   Pencils

5. Procedure:

   a. Have students in the class collect for one week throw away bottles used only in their homes.

   b. Count the total number of bottles after one week and using class results as an average, complete the following chart.

	per family	per class	per community
Number of Throw Away Bottles			

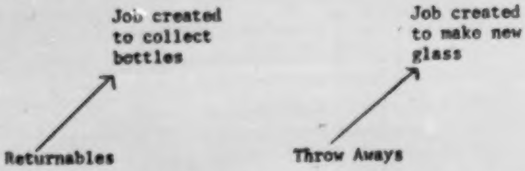
   c. In studying the following chart on glass manufacture, students should concentrate on resource and energy consumption.

	RETURNABLE	THROWAWAY	RECYCLING
mining	990	5,195	3,636
transport	124	650	360
manufacture	9,673	42,559	42,559
transport	361	1,895	1,895
bottling	6,100	6,100	6,100
transport	1,880	1,235	1,235
collection & disposal	89	468	0
collection & sorting	0	0	6,451
recycling	0	0	360
TOTAL	19,217 BTU's/gal.	58,102 BTU's/gal.	62,596 BTU's/gal.

Figures are for 16 oz. bottles that make eight round trips if returnables.

On this chart, where are energy and resources lost?

d. On the chart below have students add as many arrows as possible showing occupational and economic influences of both types of bottle manufacture.


Job created to collect bottles
Job created to make new glass
Returnables
Throw Aways

e. For the political aspects of returnable bottle legislation, study the problems encountered in Oregon. Also have the students add as many arrows as possible indicating what pressures would be exerted on a congressman for his vote. Be able to explain why the arrow was added.

Glass manufacturers
Congressman

Have students write to their congressman to find his/her stand on the bottle issue.

f. Students should list the positive and negative social implications of both returnable bottles and throw away bottles.

Returnable

Positive

Negative

Throw Away

Positive

Negative

g. List any technological advances, machinery, etc., that have resulted or would result from the use of returnable or throw aways.

Returnable

Throw Away

6. Discussion questions:

   a. How do technological advances in either returnable bottle or throw away bottle manufacture influence the environment and the economy?

   b. From the number of bottles collected in class, are throw away bottles a problem in this community?

   c. It has been stated that a family will save $25 per year by using returnable bottles. Explain how this would be.

   d. Where is your nearest bottle recycling center?

   e. What would this world be like without glass?

   f. Each student should ask five neighbors to clean and save throw away bottles for three weeks at which time the student will collect them. Analyze the responses received by the students as an indication of social attitude.

   g. Where does glass come from, what resource?

7. References:

Swatek, Paul, The User's Guide to the Protection of the Environment. New York: A Friends of the Earth/Ballantine Book, 1970. pp 126-8.

Oregon Experiment Newsweek 83: 90 April 15, 1974

Can Ban Newsweek 81: 79-80 April 2, 1974

Where the Future Works Newsweek 83: 49-50 Jan. 7, 1974

Deposit on Litter Nation 213: 6 July 5, 1971

Clean Town, U.S.A., movie

Junior High

Carol H. Zale

Study of Pesticides

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Effective environmental decision making includes considering carefully the pros and cons of all possible alternative solutions, policies and actions, and studying the trade-offs among them.

3. Time: This will require approximately fourteen days spaced throughout the growing period of the plants. This experiment should be done in the spring of the year.
   - day 1 - plant tomato seedlings
   - day 2-11 record any changes in the plants
   - day 12 compile data and discuss your feelings forming personal judgement
   - day 13- form groups with those students who felt as you did and discuss reasonings.
   - day 14- debate with the class your feelings

4. Materials:
   - a. large planter
   - b. tomato seedlings
   - c. grubs (these can be purchased at the Carolina Supply House)
   - d. any commercial pesticide that will kill grubs
   - e. Data sheet

Growth Chart for Tomato Plants

List any notable differences between the control group and the experimental group.

Plants with pesticides	Plants without pesticides
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	

5. Procedure:
   - a. Plant tomato seedlings in planter.
   - b. Have the students spray the plants in the control group with the pesticides and introduce the grubs into the planter.
   - c. Each of the students will record their observations on the next nine designated days of any changes that occur in the plants.
   - d. The students should compile the data and discuss it, trying to form a judgement.

6. Discussion Questions:
   a. How did the pesticide effect the control group?
   b. How did the grubs effect the experimental group?
   c. Can you think of any long range effects that may be encountered by society from the decision that you arrived at during the experiment?
   d. Do you feel that your decision is absolutely correct for all of society? Why?

Junior High

Glen Erickson

Investigating An Issue

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Effective environmental decision-making includes considering carefully the pros and cons of all possible alternative solutions, policies and actions, and studying the trade-offs among them.

3. Time: Indefinite, depending on particular issue selected.

4. Materials: Introductory remarks: Environmental decisions occur every day, in our personal lives and in communities and society at large. It becomes extremely difficult for any one person to become knowledgeable concerning all or most of the decisions that are made in our communities. However, developing a method for obtaining and evaluating information and opinions about an issue, along with possible alternatives provides us with a strategy for solving or suggestions for solutions to most of the environmental problems we face. This activity is designed to suggest possible ways of developing this strategy for finding solutions to environmental problems.

   a. Telephone and Telephone Directory
   b. Pens, or pencils, and paper
   c. Outside speakers, if possible

5. Procedure:

   a. Select an issue of local environmental concern that has been covered, or is being covered by local media (newspapers, radio, television).

   b. Have class discuss and list on board all information that they have themselves concerning the selected issue.

   c. Divide the class into groups to seek out information from local sources, such as:

      (1). Local newspapers
      (2). Local radio and television stations
      (3). City Government Commissions and Departments (Planning Commission, Trafic Control, Drain Commission, etc.)
      (4). Local Citizen Interest Groups
      (5). Local Ecology Center
      (6). Local major industries and businesses
      (7). Local School System officials
      (8). Congressmen or women, and Councilmen and women

d. After each group has selected a specific information source to investigate, discuss the various ways for each group to use in their investigations, such as:

(1). Use the telephone. When using the telephone, make clear with an outline, the main points you are interested in discussing with a representative for the particular information source you are calling. Mention your particular interests and key questions and ask for an interview time, either in person or on the telephone. If possible, arrange for that representative person to come and talk with the class.

(2). When looking for information from a newspaper, be critical. That is, be aware that newspapers align themselves toward certain groups of people: rural, urban, businessmen, political parties, ... and therefore present information with opinions favoring their readership. If possible, read more than one newspaper which has information relevant to your issue, and try to see who the readership for a particular newspaper is.

(3). Write letters, if time permits. Ask for specific information from the person or group you are writing. This makes it easier for them to give you relevant information by a particular time.

(4). Whenever possible, meet with people directly. You can usually get the best information this way. Allow yourselves to be flexible and open-minded when you speak with someone. Remember, you are seeking information from someone, so be a patient, but questioning listener.

(5). If your issue is being considered in a local meeting, such as a school board meeting, city council meeting, public hearing (many environmental issues are openly discussed in local public hearings), try to send a representative from your class to that meeting.

(6). When looking at radio and television stations, first call them and see if they have anyone reporting or editorializing on that issue.

(7). Whenever you speak with anyone about your selected issue, ask them if they know of other people or groups you might contact to gain more information about your issue. People-contacts often prove to be the most informative sources.

e. As groups obtain information, compile an outline on which they can jot down the contacts they've made and a brief statement or two about the information the group obtained.

f. The length of any issue-investigating activity is flexible and can take a few days to a week or longer, especially if letters are written.

g. After most or all of the investigative work is completed (it is best to set a date by which every group will complete their initial information investigations), outline on the board all the possible alternatives to the problem selected.

h. Then have a representative for each alternative present the pros and cons, as they see them, of their particular alternative. A very good way to do this is to have the class act as a council meeting to decide upon which alternative appears best for your community, county, state, etc.

i. Bringing in outside speakers to your class at this point would be very valuable.

j. Have the class decide upon the best alternative and possibly write a letter to the Editor, or to a local Planning Commission, School Board, City Council, etc. to voice your concern about the issue you have selected.

6. Discussion Questions:

a. What sources of information did you look at?

b. What people did you speak with?

c. Can you identify the people that a newspaper, radio or television station aligns themselves to — their constituency?

d. What groups of people have the best power in making a decision? Low-income families, workers, farmers, children, etc.?

e. What groups have the most power in making decisions about your particular issue? Businesses, industries, professional people (doctors, lawyers, scientists, etc.), Planning Commission, City Council, etc.?

f. Did you have an opinion about your selected issue prior to your investigative work? If so, did that change during this activity, and how?

g. Do you feel that this particular issue is being considered fairly in your community, by viewing all alternatives and the consequences of each alternative, or do you feel this issue is being decided in favor of one group of people over other groups?

Junior High Tom Derda

Characteristics of a Contained Environment

1. Concept to be developed: Environmental Decisions
2. Understanding to be developed:

   Individual or personal decision making involves one's feelings, attitudes, and values.
3. Time: Two or Three Hours.
4. Materials: (optional) Have displayed on the table the following items: radio, transistorized radio, items of food- (dehydrated rations), wardrobe items-picture of space suit, battery, green plant, large cardboard model of the spacecraft.
5. Procedure:

   a. Introduce the exercise by asking the following questions:
      1) What must be in the spacecraft when it leaves the earth?
      2) How can man survive in such a system?
      3) What transformation of energy must be made?
      4) How has science technology been able to adapt items to fit into the space home?

   b. The following three statements and questions should be typed and reproduced on the ditto machine.
      1) An environmental control system must be maintained on the spacecraft. The atmosphere must be similar to that on earth.
         a) How is this achieved on the spacecraft?
         b) Why is a higher percentage of oxygen used in the spacecraft?
         c) How does the crew know the supply of gases in the cabin?
         d) How is the oxygen stored?
         e) Why must the oxygen be kept cool?
         f) What is a supercritical system?
         g) Why must all available space and weight be carefully considered?

      2) As the crew consumes oxygen and food, waste products are produced.

         a) What are the waste products?
         b) Why must they be removed from the spacecraft?
         c) Why might a chemical compound such as lithium hydroxide be used on a space mission?
         d) What pollutants, other than human ones, might exist in the space capsule?
         e) How are these pollutants managed?
      3) Water and food are necessary for the spacemen.
         a) How is food stored? What does this conserve?
         b) How can water be obtained? How is storage space conserved when water is made by the power plant?
         c) When space is so limited, can human wastes be recovered and used?
         d) Where could food be grown to supplement the supply taken for the trip.
         e) What other supply would the green plant furnish?
         f) What happens to the heat and body perspiration? Odors?

c. Suggest that groups be formed, according to their special interests, to investigate and report their findings on the following topics.

  a) Devise a way to remove carbon dioxide from the cabin in longer space travels.
  b) Suggested ways to overcome the human aging process during very long space flights.
  c) Devise a way to reconstitute oxygen from water and carbon dioxide on long space flights.
  d) Investigate the possibility of taking green plants on space missions.
  e) Investigate the way astronauts keep fit in an enclosed cabin.
  f) Investigate the many by products which the space age has given us.
  g) Investigate a space station as a closed environment.
  h) Investigate a sea lab as a closed environment.
  i) Make a list of other small closed environments that occur here on earth.

d. Arrange again in groups. On large paper each group must draw up its own blueprint for a conserved spacecraft. Include food, water, oxygen, wastes, carbon dioxide, and energy in the contained environment along with two astronauts.

The teacher should then explain the situation of sending two such spaceships on a long journey to Mars. After landing, one ship is damaged and is unable to return to earth. The group must list all alternatives in returning all the astronauts to earth. Finally, only consider the possibility of returning all four men in one spaceship. All necessities and systems must be altered to accomplish this task. Discussion on the importance and conservation of air, water, fuel, food, energy, and equipment follow, and a group consensus must be achieved.

6. Discussion Questions:

  a. How is the earth like a spaceship?
  b. Are there ways you see that the school operates as a closed system? Name these.
  c. Reflect on our own community and its resources as a closed environment.
  d. Examine the idea of recycling used objects on earth.
  e. Discuss some of the world's philosophies on pollution, energy, and natural resources.
  f. Just what are the most important items on this planet?

7. References:
  a. Operating Manual for Spaceship Earth by Buckminister Fuller
  b. other environmental books by Buckimnister Fuller.
  c. Other environmental books by Noel McInnis.
  d. Simulation Game distributed by the Coca Cola Company called "Make Your Own World" and "Spaceship Earth".

Junior High

Glen Erickson

Is What You Decide What You Believe?

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Individual or personal decision-making involves one's feelings, attitudes, and values.

3. Time: 1 hour

4. Materials: blackboard, paper, pencils, and ditto.

5. Procedures:

   a. Make up two dittos with the following questions, plus any you might think of:

      (1) This group of questions on one ditto:

         (a) What kind of car would you like to own someday? Why?

         (b) What kind of job do you look forward to having someday? Why?

         (c) Do you feel each one of us has a certain amount of responsibility to try to live a life-style that is concerned with protecting and improving the quality of life for everyone, including people not yet born: your children, and their children? Why or why not?

         (d) Is going to school important to you? Why or why not?

         (e) How might schools change to make you feel better about going, than they do now?

      (2) This group of questions on one ditto:

         (a) Imagine you knew someone who could get you a summer job that paid good money, simply because you knew that person. You don't really need the job, but it would allow you to buy many things that you wanted. You find out about another person who is qualified for the job. He has a family to support and needs the money. He would be able to work all year on the job, because he isn't going to school. What would you do, and why?

         (b) How do you feel about the population problem? Does it exist? Is it very important, and why? Is it right for some people to control their family size, and not right for other people? Who is it right for, and who is it not right for, and why?

(c) Today (1974) there exists extreme drought conditions in Africa (the countries in and directly south of the Sahara Desert). The people hardest hit are nomadic (traveling tribal groups which base their whole way of life around their cattle herds. Until recently there was not enough water and grass for the cattle and consequently many cattle and many people have died. Recently, other countries have sent in people with equipment to dig very deep water wells into a huge underground lake. Now at these wells there is plenty of water for everyone and their cattle. Since then, the people near the wells increased their cattle herds, and now there is not enough grass for all the cattle. Water is again scarce. Were the other countries right in digging the wells? Should wealthy countries give them money to build huge irrigation systems to feed many times more cattle than ever before, allowing the people in this region to increase their population greatly?

(d) Would you rather be a person or a rock? What is special about being alive? Is it better to be a living person, than to be another kind of living creature? Or is it the same?

b. If you like you could write each question separately on the board before breaking into class or group discussions.

c. After having the students answer the first set of questions, have them break into groups of 5 or 6 to discuss their responses and their reasons.

d. Now have the class answer individually, again, the second set of questions.

e. Class discussion should follow, sharing out different students' feelings and responses (you might want to first discuss this set of responses in groups, before going into a whole class discussion) to this second set of questions. Comments about the first set should also be encouraged.

6. Discussion Questions:

a. Do you think a person's feelings, attitudes, and values play an important role in arriving at decisions?

b. Is it important for a person's behavior or actions reflect that person's feelings, attitudes and values?

c. Do you think a person should try to be consistent in his or her actions? Why?

d. Is there any good in expressing your feelings and thoughts with others, with the class?

e. Is it easier to express yourself in writing, in talking with one person, a group, or the whole class?

Junior High Glen Erickson

Laws and Ordinances: Are They Necessary?

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: In many cases it is necessary to change the law in order to prevent environmental abuses.

3. Time: 2 hours: 1 hour field trip
   1 hour discussion and comparison

4. Materials: Introductory remarks: Many times businesses and industries interested in profits, and consumers interested in convenience, do not consider the environmental abuses caused by their actions important enough to make them change their behaviors voluntarily. However, for the greater benefit for all people, certain actions by businesses and industries and individual people which are detrimental to the quality of everyone's lives must be prevented through laws designed to increase the quality of people's lives in general.

   a. Cameras (optional, but recommended)
   b. Telephone Directory and telephone
   c. Blackboard
   d. Magazines

5. Procedure:

   a. Go on a field trip to a local business district along a major street in your community (wherever drive-in hamburger places are is a good place). If you have access to Instamatic cameras, have the students take pictures of the different types of signs (advertising) they see. Especially try to take pictures looking down the road (as if you were traveling along the road).

   b. Have the students make a list of the different signs, such as:

      (1). Large signs near the road
      (2). Large signs away from the road
      (3). Especially distracting or irritating signs
      (4). Signs on buildings (flush with the building)
      (5). Number of signs for one business
      (6). Especially appealing or non-distracting signs

   c. Have the students find pictures from magazines, or ideally take the pictures themselves, or a street where signs are limited in size, number, closeness to road, and in general, functional but not distracting.

   d. Let the class discuss the visual appeal of both types of streets, thinking about safety and aesthetics.

e. Contact your city government to find out if any sign ordinances are enforced by your community.

  (1). If your city has such an ordinance, what violators of the ordinance can you witness?

  (2). If your city has no sign ordinance, what suggestions for such an ordinance can you make?

f. This activity can be designed around many other issues, like:

  (1). Air pollution controls
  (2). Water pollution controls
  (3). Noise ordinances
  (4). Soil erosion ordinances
  (5). Non-returnable containers controls (such as in Oregon)

6. Discussion Questions:

a. Why do you think signs are bigger and bigger, with more and more lights (think of Las Vegas)?

b. Do you think businesses will voluntarily limit the size, number, and locations of their signs? Why? Are laws and ordinances the only way of limiting signs?

c. Think about traveling on rural roads compared to traveling on streets lined with businesses. How do you feel about looking around? What are the most dominant things to see?

d. Do signs play any part in drivers becoming distracted or irritated when they drive?

e. What ways can people make traveling through a city more relaxing and less eye-straining, realizing that businesses want to advertise?

f. Without any city ordinance limiting signs, when do you think businesses will limit their signs (size and number)? Ever?

g. Observe how many billboards are along the street (or in your pictures).

  (1). Can billboards be appealing or aesthetic?
  (2). Are they safe?
  (3). Are they really necessary for businesses? Do you feel billboards deteriorate the quality of your environment?

h. Would one or two clear, simple, appealing signs be nearly as functional as several, large, neon signs for a business?

i. When does private advertising infringe on the public's right to a quality, appealing environment?

Junior High

Harry Tindall

A Bill to Ban Pesticides

1. Concept to be developed: Environmental Decisions.

2. Understanding to be developed: In many cases it is necessary to change the law in order to prevent environmental abuses.

3. Time: 5 days - day 1 - Discussion of danger of pesticides and possible need for a law. Film.
   day 2 - film.
   day 3 - discussion of legislative procedure and display illustrations (Here, time must be given for witnesses to prepare testimony--couple of days?)
   day 4 - simulation game (How many days depends upon how well the witnesses play the game.)
   day 5 - discussion.

4. Materials: reference materials on environment, films, drawing paper, colored pencils.

5. Procedure:

   a. As the dangers of pesticides are discussed as part of water pollution, the natural question is "How can we halt the widespread use of pesticides?"
      1. by education?
      2. by propaganda?
      3. by community pressure?
      4. by law?

      Let us assume a law strikes the class as the most fair and effective way. How do we get a law?

   b. Film: CHANGING THE LAW. Discussion.
      Question: How does a bill become a law?

   c. Film: STATE GOVERNMENT. Discussion. List the steps.

   d. Assign class illustrations of each step. Try for originality and cleverness.

   e. Display illustrations to class, comment and discuss meaning.

   f. Emphasize the fact that the real work of the legislature is done in committee. Explain how a committee operates in studying a bill and propose a simulation game for the class. After explaining the game (if necessary), students are to choose a role they wish to play from the following: (Use Watergate Committee as example)
      1. five to seven committee members
      2. three professors of Environmental Studies (from Universities of their choice)

3. two or three fruit growers
4. two or three corn growers
5. one lobbyist representing the Grange
6. one member from each of several conservation societies--the Sierra Club, Audubon Society, National Wildlife Society, others.
7. one official from "Great Lakes Fisheries"
8. one official from the Michigan Environmental Protection Agency
9. others--you may have to create some societies to get the entire class into this committee study
10. two newspaper reporters who will write some headlines about certain "hot" testimony presented to the committee
11. one T.V. newsman who will make a "report" after the hearings are completed.

g. The degree of success of this game will depend upon how seriously the members of the class play the game. They must combine "Homework" with charm and imagination. "Homework" means they are prepared with the answers to all sorts of things. They must not only know all aspects of the problem, but they must be particularly well versed on "their" side.

h. Find out what bills are before your legislature now regarding environment. Class members may wish to write some letters in support of or opposed to these bills.

6. Discussion Questions:

a. Getting a bill into a law is a long, arduous procedure that takes months and even years sometimes. What are the pros and cons of this snail's pace?

b. Why do communities have laws? How does a law differ from customs and mores?

c. Why is most of the work of the legislature done in committee?

d. Why is the committee chairman such a powerful position. Is there any way to get around him?

e. Suppose your pet bill is being stalled in committee. Is there any way that you, as a legislator, can pry it out to the full House?

f. Do you think the bill to ban pesticides was a good one? Why did DDT get banned a long time ago?

g. Why did the committee call in so many witnesses? Were both sides represented fairly? Can anyone testify before a committee?

h. Are new laws on environment the first priority in our legislatures? Should they be? Why is it difficult to get the legislature to move on environment as quickly as a bill, say, on raising the minimum wage?

i. What could happen to make the legislature move more quickly on environmental bills?

j. What are some environmental bills you would like to propose to the legislature at this time? Why?

7. References:

a. Introduction to Environmental Science, Phillips W. Foster.
Learning Systems Company, Homewood, Illinois, 60430.

b. Silent Spring of Rachel Carson. Film.
AV Center, Indiana University, Bloomington, Ind. 47401

c. Gardening Naturally, D.X.Fenten, Franklin Watts, Inc. New York, 1973.

d. Pests and People, Lawrence Pringle
McMillan Publishing Company, Inc. New York 1972.

e. Water Pollution, George Laycock
Grosset & Dunlap, Inc., New York, 1972.

f. Earth, the Great Recycler, Helen Ross Russell
Thomas Nelson, Inc., New York 1973.

Senior High Tom Wencel

A Comparative Study of Sudsing Agents

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Decisions not carefully thought through frequently have unwanted results.

3. Time: Pre Lab - 10 minutes
   Lab - 30 minutes
   Post Lab- Comparison of sudsing 24 hrs later. Discussion.

4. Materials: Three large test tubes, three rubber stoppers, handsoap, washing machine detergent, dishwashing liquid, balance, metric ruler, distilled H_2O, marking crayon.

5. Procedure:

   a. Fill each of three test tubes with 25 ml. of distilled water.
   b. Mark the test tube H, W, and D for handsoap, washing machine detergent, and dishwashing liquid.
   c. Fill test tube H with 5 grams of handsoap, fill test tube W with 5 grams of washing machine detergent, and test tube D with 5 grams of dishwashing liquid.
   d. Stopper each test tube and shake it for one minute.
   e. Measure the height of suds in each test tube.
      1) tube H__________mm.
      2) tube W__________mm.
      3) tube D__________mm.
   f. Twenty-four hours later measure the height of the suds in each test tube.
      1) tube H__________mm.
      2) tube W__________mm.
      3) tube D__________mm.

6. Discussion Questions:

   a. Why did we measure suds height both after the activity and 24 hrs later?
   b. Advertisers try to sell us detergents that "keep on sudsing". Is that necessary for washing hands? for washing clothes? for washing dishes?
   c. Where does the water go that we pour down the drain in our area?
   d. People on the lower Mississippi River complain that they get a "head of foam" on a glass of drinking water, What causes the "foam"?
   e. Would you enjoy foam on your glass of water? If not, what could be done about it?

7. Resources: Local soil conservation district officer.

Senior High

Glen Erickson

Shopping Center Analysis

1. Concept to be developed: Environmental Decisions.

2. Understanding to be developed: Decisions not carefully thought through frequently have unwanted results.

3. Time: 2 days - 1 week.

4. Materials: Introductory Remarks: Shopping centers are frequently built with a minimal amount of planning, responding to consumer pressures and needs, and often creat needs in people that were not present before. Environmental considerations are all but forgotten in the planning for a shopping center, but surface as problems later on. We, as a class, will look at a constructed shopping center (or if possible, one in construction) to see what environmental considerations were accounted for in the planning, what problems have already surfaced, and the impact on the neighboring residents.

    a. Field trip to local shopping center, as a class, or individually.

    b. Student-designed questionnaire for neighboring residents.

    c. Evaluation form for looking at shopping center.

    d. Ditto for questionnaire and evaluation form.

    e. Pens or pencils.

5. Procedure:

    a. Identify a local shopping center.

    b. Develop a questionnaire to give to neighboring residents of the shopping center, with questions such as:

        1. Did you live in this area before the shopping center was constructed? If so, what was the area like before the shopping center was built?

        2. What problems do you notice associated with the shopping center (noise, traffic, etc.)?

        3. What do you like about having a shopping center nearby?

        4. Is the shopping center aesthetically pleasing (interior, exterior?)?

5. Do you feel crime in your neighborhood has changed with the construction of the neighborhood?

6. Were you consulted in any way before the shopping center was built? If so, in what way, and by whom?

c. The students should divide into two groups; one group will design the questionnaire and conduct the survey of the residents, and one group will develop the evaluation form and conduct the survey of the shopping center and adjacent areas.

d. The evaluation form should include such information as:

1. Make an estimate of the total area of impervions surface (impervions being any surface water cannot seep through: buildings, parking lot) for the shopping center.

2. Note the number and average sizes of any trees on the shopping center.

3. How are the trees or shrubs planted; in boxes, in areas filled over with stones or wood chips, or in bed-type areas?

4. Estimate the maximum parking area ever used at one time.

5. Check for drainage; sewers, ditches, holding ponds, nearby stream. Where does all the water go that falls on the impervions surfaces of the parking lot, and buildings?

6. Is the area aesthically pleasing or not, and why?

7. Note the roads leading to the shopping center. Were they there before the shopping center, or were they widened or constructed because of the shopping center?

8. What kinds of stores are at the shopping center? Are there any small shops or unique stores or just large chain stores?

9. Do you think people use the shopping center for convenience, lower prices, specialty shops, atmosphere?

10. Is there evidence that the shopping center was constructed where a farm used to be, or a residential area, or an open field?

11. Is there evidence that large trees were removed for the shopping center? If so, how could they have been integrated into the shopping center complex, rather than being removed?

e. After both the questionnaires and the evaluation forms are completed, the results should be compiled and given to the whole class.

f. Contacting a local planning official or a knowledgeable person (maybe from a local citizen group) about the shopping, and inviting them to speak to the class could provide valuable insight for the class.

g. The class should now make recommendations on how this shopping center could be better, and also ways of constructing such centers considering the environmental aspects of its construction.

h. A model shopping center could be constructed by the class.

6. Discussion questions:

a. What functions do shopping centers play in your community?

b. Do they only meet existing consumer demands, such as: convenience variety of merchandise, lower prices, or do they create needs in people that didn't exist before, such as: driving to the store, doing all your shopping at once. etc?

c. Community shopping areas are present throughout history; market places, plazas, public congregating and socializing areas. Do shopping centers today offer any of the pleasant aspects of shoppings areas in the past? Are they friendly places to congregate and meet and talk with people?

d. Would you go to a shopping center if you didn't intend to purchase something?

e. Are several small shopping centers better than one large one?

f. Do zoning practices change when a shopping center is built, such as changing the zoning from residential only to commercial or industrial zoning?

g. How does the presence of a shopping center affect the neighboring area? Do more businesses, or apartments, or gas stations come into the area?

h. What role does the construction of shopping center play on the decay of the central business district of the city, the downtown?

Senior High Gene Wozniak

Pay More - Get Less

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: People most often affected by Environmental abuses may be least able to bring about affective action to correct them.

3. Time: 2-3 days (Note: advanced time to complete preliminary assignments)

4. Materials:
   a. Map of the Metropolitan area for each student.
   b. Film depicting primarily urban environmental problems such as DON'T CROWD ME (16 min.)

5. Procedures:
   a. Several days in advance of the classwork, make the following assignment to each student:
      (1) Get a map of the metropolitan area of Detroit and mark the location of four different industries or other enterprises that would be undesirable for you to live near, such as: a steel mill, auto plant, sewage treatment plant or any other you can think of. The phone book will aid you in finding them.
      (2) For each industry or other enterprise you have located list all the disadvantages of living close to them as you can think of.
      (3) For each industry or other enterprise you have located try to determine the type of housing near each. Classify housing as OLD (25 yrs and older) or NEW. Also indicate whether it is single, two family or multiple family dwelling- You can get your information by personal observation or by asking someone familiar with the area.
   b. The day classwork on this understanding is to begin, show a film dealing with urban environmental problems such as: Don't Crowd Me. Have students add to their list of disadvantages of living near the industries they chose.
   c. After the film, select several students to mark the location of the industries they have selected on a map placed in the front of the room.
   d. Discuss the type of housing and disadvantages of living near each location.

6. Discussion questions:

   a. Why do people live near industries or other enterprises which might affect the quality of their lives?

   b. What economic segment of the population generally live in the locations identified?

   c. What educational level is generally found in this group of people?

d. Why are these people limited in the ways they can improve the quality of their lives?

e. Are these people the ones most likely to share in the affluence our modern society has produced?

f. In what ways do these people pay a greater cost for our way of life than others living farther away from those offending industries?

g. What are some possible ways to quality of life in these areas can be improved?

7. References:

a. Population Resources Environment. (Issues in Human Ecology) Erhlich and Erlich. p. 117-148.

b. Self Review in Introduction to Environmental Science, Phillips W. Foster, p. 110-34.

c. Man and His Technology - Problems and Issues. E. J. Piel, J. G. Turxal, p. 74, 79.

Senior High

Ann P. Sibole

Community Problem Solving

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: People most often affected by environmental abuses may be the least able to bring about effective action to correct them.

3. Time: 30 minutes.

4. Materials: Task cards with the following information should be made up ahead of time: (You may want to use local issues.)

Pick one of the following problems which occurs in communities;

- a. mosquito control problem
- b. where to locate a housing development
- c. locating a new freeway through an existing urban area
- d. locating land for a new recreation area near a city
- e. where to build a solid waste plant for a large city
- f. conflicting use controversy of local body of water (dumping mine wastes, recreation or wildlife?)

The following people are available to help with the community problem you have chosen. On paper, explain what each of them might be able to contribute to solving the problem the most beneficial way to the community:

artist
economist
lawyer
ecologist
engineer
sociologist
doctor
chemist
philosopher
agriculture expert
recreation specialist
city council person

5. Procedure:

- a. Pass out task cards to groups of three students. Use local community problems if possible.
- b. Groups follow directions on the cards. Have one person be the secretary.
- c. Ask them to add 2 more people to the list and tell what their role would be.
- d. Call groups together for general discussion during which someone from each group should explain what they did.

6. Discussion Questions:

   a. Did you find people on the list that did not play a role in the problem solving?

   b. Did some people listed play the same role in several problems different groups worked on?

   c. Who played a different role, depending on the problem the group picked?

   d. What part would you most like to play? Do you think you would enjoy doing it for a living?

   e. What about the ordinary citizen? He isn't listed. How do you feel about this - Should he be? Does he have anything to do with making decisions or is it all in the hands of the experts? Explain.

Senior High

Glen Erickson

Who Benefits, and Who Pays ?

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Environmental decisions should seek to improve the lives of people from all socio-economic classes.

3. Time: 2 hours

4. Materials: Introductory remarks: Many decisions are made under pressure from lobbies (interest groups) representing select people, for instance: oil lobbies, industrial lobbies, and farm lobbies. Government expenditures often follow the interests of the most powerful lobby and directly benefit only that interest group, while being paid for by the general populace who receive minimal or no benefit from the expenditure. This activity is designed to help students evaluate decisions to see who benefits from them, and who ends up paying for them.

   a. Large file cards
   b. Blackboard and chalk
   c. Paper and pencil

5. Procedure:

   a. Make up information cards with the following pieces of information on them (one piece per card):

      (1). SST(s) (Super Sonic Transports - airplanes) can fly much faster than present commercial airplanes. Passengers on an SST could fly from the United States to Europe three to four hours faster than on present airplanes.

      (2). Building an SST in the U.S. would enable the U.S. to keep pace with other large countries (Russia, France, England) in future air transport. Other countries are already building SST(s) and will take over the market from the U.S. in rapid-air-transportation.

      (3). Construction of SST(s) will provide thousands of jobs for people. The U.S. economy will benefit directly, especially when other countries begin buying our SST(s).

      (4). The SST generates less pollutants per passenger mile than most other transportation alternatives.

      (5). SST(s) cause sonic booms (when airplane travels faster than speed of sound) all along their routes.

(6). Most experts feel that SST exhausts will disrupt the fragile layer of ozone gas surrounding the earth. Ozone prevents damaging ultra-violet light from reaching the Earth.

(7). Only a small number of people will benefit directly from SST construction:

(a). Only six states will benefit economically from SST construction. Forty-four states will lose money from SST construction.

(b). Only people in higher economic classes can afford to fly on an SST. Poorer groups of people will probably not be able to use them.

(8). The SST will use twice as much fuel as the larger capacity Jumbo Jets (like 747(s)) for the same distance flight.

(9). Building the SST-prototypes will cost nearly 1½ billion dollars. These are just the test models.

(10). The newly constructed British SST, CONCORDE, is not selling. Presently, there is little or no market for the SST.

b. Give one information card to each of 10 groups of students.

c. Have the class discuss what they have heard about the SST (Presently, the U.S. has stopped construction of an SST, mainly through the efforts of environmental groups). During the discussion, have the groups offer their piece of information when the discussion begins to focus on their piece of information.

d. After all 10 information cards have been presented, along with other opinions and pieces of information from the class, have the class list on the board the pros and cons of approving the construction of an SST for the U.S. to use and sell.

e. The class should now list alternative ways for the U.S. to spend 1½ billion dollars to benefit more people than building an SST (such as: mass transit, housing, more recreational areas in cities, etc.).

f. Now have the class vote on the issue of building an SST, or using the money for something else.

g. Directly following this activity, or at some later date, research and discuss an issue directly relevant to your situation, considering who will benefit from the decision, and who will pay for the decision.

6. Discussion Questions:

   a. Who do you feel least, most benefits from construction of an SST?

   b. If an SST were built today, do you feel you would ever be in a position to use one? If so, how long do you think it would be before you did use one?

   c. Who do you think was pushing the strongest for an SST? Who opposed it most strongly?

   d. Is it important for the U.S. to compete with other large countries all the time?

   e. Should the U.S. try to have the fastest, most luxurious, mode of air transportation simply to be able to say we have such an aircraft?

   f. Realizing that 40 percent of the people who live in large cities (New York, Detroit, Chicago) don't have access to an automobile, how could the U.S. government more justly spend tax monies on something like an SST?

   g. Which people have the least power in influencing major decisions (like the SST) and who have the most power? Compare these with who you felt benefit least and most from major decisions.

   h. What kinds of employment can you think of in which the workers never or rarely use or benefit (other than their job pay) the product they make?

Senior High Debbie Springer

Equality of Recreational Facilities

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Environmental decisions should seek to improve the lives of people from all socio-economic classes.

3. Time: 2 days - day 1 - introduction and group decision
day 2 - class discussion.

4. Materials: Chart of possible state alternatives for each student. Students should be given the information that 70% of the population of Michigan lives in the South Eastern section.

5. Procedure:

   a. Students should be presented with the following information:
      1) The State of Michigan is holding a public hearing to determine how funds from a recently passed State bonding issue for acquiring outdoor recreation land is to be allotted.

      2) The bonding issue provides 100 million dollars.

      3) The present state alternatives are as follows:

	Land in and around South East Michigan	Land in Northern Lower Michigan	Land in the Upper Peninsula
1)	34%	32%	34%
2)	10%	30%	60%
3)	30%	60%	10%
4)	60%	10%	30%

   b. Your school has been asked to send a representative to the public hearing.

   c. Students must reach a decision on the stated alternatives for allotment of recreation land.

   d. Students spend class time of day 1 in group decision making.

   e. The class will reach a joint decision through discussion on day 2.

6. Discussion Questions:

a. Do you feel that other alternatives should be considered?

b. Does your decision improve the lives of people from all socio-economic classes?

c. Do all socio-economic classes have access to the proposed recreation facilities?

d. Does your decision take into account differing property values throughout the State of Michigan?

e. What recreation facilities would be most appropriate for each area?

f. What facilities are most needed in each of the three areas?

g. What age group would most benefit from your proposed recreation facilities?

h. Does your decision take into account future population growth?

i. What effect will the development of a recreation facility have on the surrounding community?

j. Will your decision affect the ecological balance of the proposed areas?

k. Should State recreation funds be used to acquire land within city limits?

Senior High

Jeannine Bosma
Sally Sharp

Snowmobile Use Study

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Some people and organizations have more power to influence decisions than others.

3. Time: 2 days - Day 1 - Values clarification
   Day 2 - Speakers pro and con (example: pro - Michigan Snowmobilers Association member or dealer; con - Sierra Club, or M.U.C.C., or farmers)
   Additional time for research

4. Materials: a. Pencil and paper
   b. Continuum Sheet:

Value Related Questions: Snowmobiling

1.	All snowmobiles should be banned from forested areas to preserve wildlife.	SA	A	N	D	SD
2.	It is possible to use snowmobiles without infringing on the rights of others.	SA	A	N	D	SD
3.	Snowmobile regulations should be placed in the hands of the people who use snowmobiles.	SA	A	N	D	SD
4.	It is prestegious to own a snowmobile.	SA	A	N	D	SD
5.	More snowmobile trails should be built on state lands.	SA	A	N	D	SD
6.	Much revenue is brought into the state because of snowmobiling.	SA	A	N	D	SD

5. Procedure:

   a. Class as a whole defines the issue of whether or not snowmobiles should be restricted or unrestricted in use.
   b. Using the continuum sheet, have students individually record their own feeling about snowmobile use.
   c. Take each question and discuss opposing views and possible alternatives and implications of their choices.
   d. Formulate questions, using the arguments discussed above to ask the speakers tomorrow.
   e. Students do own research and gather material to make decisions.
   f. Student makes his own choice after hearing different arguments presented by the two speakers.

6. Discussion Questions:

   a. Is it necessary to have restrictions of any type on recreational vehicles? Why?
   b. Could you use the same arguments about trail-bikes as you did with snowmobiles?
   c. Why should everyone be familiar with the regulations we now have concerning snowmobiles? Should we add or subtract any laws?
   d. Keeping in mind the arguments you have heard, pro and con, which group has influenced our legislature the most?

Senior High

Ann P. Sibole

Transportation Policies - Riding with Reason

1. Concept to be developed: Environmental Decisions

2. Understanding to be developed: Some people and organizations have more power to influence decisions than others.

3. Time: class period

4. Materials: Introductory remarks: Although advanced technology continues to respond to changing transportation needs, the problem of moving people is essentially a social, not an engineering issue. When making transportation policy we must balance personal needs, particular group interests, and the needs of the community as a whole. In class, we will attempt to simulate a Congressional hearing on the Highway Trust Fund. The issue is whether or not to make highway funds available for the construction of new mass transit systems and for the improvement of existing rail and mass transit facilities.

Questions for discussion should be put on the board:

a. What different means of transportation are available?

b. Who uses the various means and why? Consider characteristics of the population such as age, income level, and type and location of employment.

c. What are the characteristics the user looks for in choosing a particular mode of transportation? Does the user always have a choice?

d. How does the size, density and location of the population alter a region's transportation needs - especially in terms of cost, comfort, convenience, efficiency and reliability?

e. What is the impact of each transportation mode on the community, considering questions of noise, air pollution, land use, energy requirements, safety, and service benefits?

Position Statements: These should be on 5 X 7 index cards.

a. Congressman A: from Washington state - wife is a staunch leader of the Sierra Club.

b. Congressman B: from Oklahoma - former Standard Oil executive.

c. Congressman C: from New York - co-owner of largest construction company in the northeast, specializing in low cost housing construction.

d. City Planner: Construction of additional roads to accommodate community growth has only contributed to urban sprawl and has not reduced congestion. In the past, funds have been used not for widening streets, but for lengthening them, which only increases the geographic area covered and the number of people using the roads. Since roads can't accommodate unlimited numbers of autos, we should use these funds to develop alternative transportation systems that relieve highway congestion and promote more rational suburban development. Ours is not the only community that is grappling with problems aggravated by changing population distribution and density. But right now, we should be spending available funds on a mass transportation system that eventually will limit and shape future residential and industrial development.

e. Lobbyist for the Highway Trust Fund: The Fund should be used for highway maintenance and construction only. After all, the people using the roads are paying for their use through taxes on trucks, buses, gasoline, tires, and many other goods related to cars. All this talk of limiting future highway construction and use of cars is fine, but what about transportation requirements of the less developed rural areas? The enormous cost of building and maintaining rural roads to improve access to these isolated areas cannot be underestimated.

f. Environmentalist: The social cost of car use in terms of both noise and air pollution is sufficient reason for redirecting this money toward developing alternative modes of transportation and for improving existing systems in order to move more people more efficiently. The entire community is now obliged to pay for the privileges of those who can afford auto travel. In many cities, about 40% are without car transportation. Rail transit is potentially faster, less expensive, and far less damaging to the environment. In fact, six times less energy is required to move a ton of freight by train than by truck. Despite a severe oil and gas shortage, car ownership and use continue to climb.

g. Housing Developer: Suburban development has occurred for no other reason than that people want the benefits of living in a less densely settled neighborhood. They've moved to get away from crowding, to find more open space, cleaner air, less noise, etc. If mass transit is extended to the suburbs, an undesirable, but certain result will be high-density development along the transit routes. Also consider that highways provide the greatest route flexibility of all existing systems of transportation. Why should we put more money into rail systems when ridership is declining? Even modern subways offer no guarantee of luring people away from their cars. Public transit systems lock us into predetermined routes that may not follow the distribution and flow of people 15 to 25 years from now.

h. Citizens' Committee: Citizen A: Daily commuting from the suburbs to the city by car is an increasing hassle not only in terms of time, but because the parking shortage is more and more severe - just think of the cost of all the policement needed to control parking violations! But what alternatives do commuters have? Bus and train service is far from adequate. Actually it is not hard to see why so little has been done to develop balanced regional mass transportation systems if you consider the lopsided allocation of transportation funds from government sources; 5% for rails and 3% for mass transit.

Citizen B: As a city-to-suburb commuter, dependent on existing public transit, I have to change buses three times in a one and one-half hour trip to reach the suburban industrial plant where I work. Owning a car would ease this trip, but the costs involved are simply too great. And moving to the suburbs is no solution; who can afford it these days? Frankly, I see a number of social injustices in the present transportation system in this country. Of families with incomes below $3,000 in 1970, 58% had no car. Of heads of households aged 65 and over, 45% had no car. Without a better and cheaper mass transit system, how are these people to gain access to opportunities available in the mainstream of society?

i. Representative of a Motor Company: The economic effects of reducing dependence on the auto would be disastrous to the health of the economy. Just think of the many businesses and services that are related to the auto industry. At a time when the unemployment level is about 8%, we cannot afford to alter a consumption pattern in a way that would result in robbing more people of already scarce jobs. In addition it takes from 8 to 15 years lead time for planning and constructing a mass transit system. In a decade technological advances could make existing plans completely outdated. The automobile industry is sensitive to the changing needs and requirements of our growing, dispersing population and we are spending millions of dollars annually on research to make cars safer and less polluting!!

5. **Procedure:**

   a. Introductory remarks or equivalent on how environmental decisions should be made.

   b. Ask for volunteers or pick 10 students who will speak out in the hearing at some point - 3 congressmen
      7 spokesmen in the hearing

   c. Give each of them a 5 X 7 index card with their position and/or speech.

   d. Arrange the classroom in a different manner for the hearing. Explain to the remainder of the class that they will be other non-speaking members of Congress.

   e. Allow 10 minutes for the actors to get into their role and read over the card.

   f. Each speaker will make a statement.

   g. Congressmen A - C will state how they feel about the issue, after hearing all the statements, in response to the teacher interviewing them. Be sure you ask about their "special interest"?

   h. Class discussion should follow - use questions on the board to bring the discussion local.

6. Discussion Questions: (in addition to board questions)

   a. What is the purpose of a congressional hearing? Is it to make a decision at that time?

   b. What is the purpose of a local public hearing?

   c. Have any been held lately in Toledo? Have you attended one?

   d. Do you think government officials make use of the information brought out in a public hearing? Do they have to by law?

   e. What kinds of pressures might cause the public officials to ignore public opinion in a decision?

   f. Does this make you feel helpless, or is there some way of having a stronger affect on decision makers?

   g. Who do you think ought to make environmental decisions? Government? Industry? Consumers?

h. Who should make the decisions on these issues:

   1) the kind of transportation to be funded.

   2) how large a family should be.

   3) what kind of fuel we should use in the future for electric power source.

   4) how safe is nuclear power for the American public.

7. References:

a. *Interchange* (newsletter). Vol. 2; No. 2. Population Reference bureau, Inc.

CONCEPT

ENVIRONMENTAL ETHICS

UNDERSTANDINGS:

A. Lower Elementary (Kdg., 1st and 2nd)

1. Children all over the world have similar basic needs.
2. Every individual has something which he gives and which he receives from society.

B. Middle Elementary (3rd and 4th)

1. If human beings protect the earth it will be able to continue to support a diversity of living things.
2. Humans can be "stewards" of the earth, rather than careless exploiters of it.
3. Humans can develop both a way of thinking and feeling about the earth if we are to live harmoniously with each other and our environment.

C. Upper Elementary (5th and 6th)

1. If humans develop an ecologically sound way of thinking, feeling, and acting toward the earth, then we will be able to live harmoniously with each other and our environment.
2. If we protect the earth it will continue to meet the needs of all living things, now and in the future.

D. Junior High (7th and 8th)

1. The earth's resources exist for all living things, not just man.
2. Certain life styles enable man to live as a complimentary part of the environment.

E. Senior High (9th, 10th, 11th and 12th)

1. Only when each of us lives a life guided by respect for the earth and all living things, now and in the future, will we be able to live in harmony with each other and our environment.

2. An essential part of an environmental ethic is a human ethic based on social justice for all individuals and groups.

Lower Elementary

Beverly A. Kavasch

Basic Human Needs

1. Concept to be developed: Environmental Ethics
2. Understanding to be developed: Children all over the world have similar basic needs.
3. Time: 5 days
4. Materials needed: Chart paper, films, old magazines, library books, art paper, crayons, scissors, and paste.
5. Format for conducting activity:
   a. First day
      1) Establish that everyone needs things everyday to sustain life.
      2) Generate a possible listing of essential things you need. Put on chalkboard as children name.
      3) Discuss what would happen if _____(name one item) would be removed. Erase. Could you manage without it? Eliminate to basic needs.
      4) Make a permanent chart.

Basic Needs				
Air	Water	Food	Shelter	Clothing

   b. Second day
      1) Discussion: Do children everywhere have the same basic needs? Let's find out.
      2). Show film: Arabian Children (EBE, 1954, 15 min.)
      3) Discussion of film: Life style, customs, etc.
      4) Make a chart for the children in the film.
      5) Discussion questions:
         a) What were the things those children needed?
         b) Why didn't they have the things you have?
         c) Do they have the same basic needs?
      6) Mark the area studied on a globe or world map.

7) Activities:

   a) Draw a picture of something from the film - type of food, clothing, shelter, etc.
   b) Get library books and/or magazines pertaining to the area discussed to share with the other children.
   c) Make a page for a book to be completed at the end of this unit.
   d) Cut out pictures that show examples of lifestyle.

c. Third day

   1) Show film: Tuktu and His New Clothes (NFBC, FL, 1969, 14 min.)
      and
      Tuktu and The Snow Palace (NFBC, FL, 1969, 14 min.)
   2) Follow the procedure in 6., 3) - 7).

d. Fourth day

   1) Show film: South Pacific Island Children (EBE, 1951, 11 min.)
   2) Follow the procedure in 6., 3) - 7).

e. Fifth day

   1) Comparison of charts of all four geographical areas studied.
   2) Sharing of individual books.
   3) Possibly compiling books for each area with excess pages for classroom books.

Lower Elementary Talbert B. Spence

Basic Needs of all Living Things

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: Children all over the world have similar basic needs.

3. Time: 3 days.

4. Materials:

    a. Chart paper and magic markers.
    b. Art paper and colored chalk and crayons.
    c. Cassette tape recorder.
    d. Cassette tape with the following emotional sound responses.

1.	approval	6.	happiness
2.	disapproval	7.	sadness
3.	anger	8.	fear
4.	joy	9.	persuasion
5.	disappointment	10.	excitement

    e. It is important to allow about a minute pause after each emotional response (*see (b) procedures).

5. Procedure:

    a. Introduce to class: Today we are going to listen to some sounds made by a group of people expressing a feeling or emotion. We are going to listen to see if we can learn what feelings and emotions are being expressed.

    b. Play cassette tape of the sounds to the class, while the students are attempting to identify each sound — record each emotion or feeling, identified on chart paper; but only do this after each pause-when you ask the class for their comments and suggested answers.

    c. After hearing the whole tape and have recorded on chart paper all the sounds of feelings and emotions, discuss - how living things (humans) have a basic need to express their emotions and feelings.

    d. Ask the class to express on art paper individual examples of a feeling or emotion that they have a need to express.

    e. At the completion of the art project have individual students explain and describe to the class briefly the feeling or emotion they drew and why.

f. Have students discuss what the following terms mean to them.

1. air
2. food
3. water
4. a place to live
5. love

g. Discuss, (after recording on chart paper the class overall statement for terms in (f)) the relationship these terms might have with the feelings and emotions on the chart paper, recorded from the tape.

h. Ask students if they know why each of the basic every day needs are important.

i. As an experiment to investigate and prove that living things need air, have a group of students demonstrate this by holding their breath until the body forces them to breathe. Possibly to enhance this understand ng have students observe a fish tank with an air pump going and one without an air pump - have students give their interpretations as to what might happen if the tank with the air pump stopped - vs. - fish tank without air pump.

j. Discuss with class how living things recognize the need for food. Ask students how do they know when they need food?

k. Before expressing how living things need water, have each student eat a few soda crackers. Do not allow any student water fountain privileges and see how long it takes them to become agitated. When enough have expressed a need for water, ask the class how they think a living thing needs water.

l. Have students tell some of the places animals live; record responses on chart paper. Ask if there are some special places people live.

m. Have students express what love means by drawing a picture which has the following components in it:

1. need for water
2. need for air
3. need for food.
4. need for a place to live.

6. Discussion questions:

a. What is an emotion?
b. What is a feeling?
c. What is joy?
d. What is love?
e. What is sadness?
f. What living things need air to live?
g. What living thing needs food and water to live?
h. Do you need food, water, air, a place to live and love daily?
i. What is fear?
j. Anger means what to you?

7. Suggested follow-up activities:

   a. Experiment: have groups of students plant a few bean seeds in flower pots of a flower box - an equal number of seeds per pot/box. Provide adequate light and water. Ask students to explain why there is a difference in growth, considering the fact that the plants in both pots/boxes started out the same.

   b. Outdoor activity: divide class into small groups to discover something which is taking in nourishment, e.g., bird, ant other insects which may be eating or carrying something to eat. Have the groups discuss how a plant growing through a crack in the sidewalk get its nourishment.

   c. Have students select several healthy plants from experiment (a). Divide the plants into two groups. Water one group and do not water the other. Have students observe and note the different ways ways in which unwatered plants show their need for moisture.

   d. Have students design a large mural depicting all the various concepts or terms discussed throughout the activity., e.g., show fear, love, need for food, happiness, sadness,etc.

8. References:

   S. E. E. Self, Earth, Ethic, by John W. Wart and Jessie H. Turner. (laboratory experiments).

Lower Elementary

Sally Sharp

Mutual Giving and Sharing

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: Every individual has something which he gives and which he receives from society.

3. Time: Approximately two weeks.

4. Materials: Construction paper, scissors, glue, straight pins/ masking tape, markers, and cotton.

5. Procedure:

   a. Present the story "The Warm Fuzzies". (See #7 References).

   b. Conduct a discussion on student feelings about "Fuzzies" and the desirability of experimenting with interaction.

   c. Each student constructs a "Fuzzy" of his own, in the shape of an envelope, and fills it with cotton.

   d. Pin the completed "Fuzzy" holder on each child, making sure it is readily accessible to him.

   e. Each student will hand out a "Fuzzy" while extending a friendly greeting to another.

   f. Bring the class together for a debriefing before discussion questions.

6. Discussion questions:

   a. Why should we be nice to people?
   b. Should we be nice to people?
   c. How do you feel when someone is nice to you?
   d. Can you give examples of this?
   e. How do you feel when someone is unkind to you?
   f. Can you give examples of this?
   g. Do you think everyone should be nice to everyone else?
   h. Do you think it's important to think of other people's feelings?
   i. Do you believe that if you are nice to someone, that person will be nice to you?
   j. What would the world be like if no one was nice to one another? Or if everyone thought only of themselves?

7. References: "The Warm Fuzzies" story origin unknown.

"The Warm Fuzzies" is a story about mythical creatures who extend good feelings by greeting the people they meet and bestowing on each a "warm fuzzy" from the bag draped over their shoulder. All is well, and everyone feels good about themselves until the mean old troll shatters the calm atmosphere. The troll tells the little creatures that they should not dole out the "warm fuzzies" too freely for fear they will be depleted. Soon the creatures become stingy with their friendly greetings and begin to hoard their "fuzzies". The troll begins to hand out "cold pricklies", in place of the creatures' "warm fuzzies", and the people become depressed over the terrible feelings they now experience. Very shortly the mythical creatures realize how unhappy they have become and return to their previous occupation of handing out "warm fuzzies".

Lower Elementary

Talbert B. Spence

Responsibility

1. Concept to be developed: Environmental ethics

2. Understanding to be developed: Every individual has something which he gives and which he receives from society.

3. Time: Several days.

4. Materials needed:

   a. Felt board and letters.
   b. Teacher selected popular children's stories that reflect cooperation and understanding.
   c. Crayons and paper.
   d. Tape cassette recorder.
   e. Chart paper and magic markers.

5. Recommended procedure:

   a. Using a series of pictures which show people cooperating and understanding, have the students give their interpretations of what is happening in each picture. The teacher should either record their responses on the tape recorder or place them on chart paper so everyone can see them.

      (e.g. child hugging brother or sister,
      mother caring for sick child,
      children watching animals in their natural habitats, etc.)

      Note: (depending on age level of group this activity should be altered to meet the uniqueness of the classroom situation)

   b. Giving each student paper and crayons ask them to draw how they feel about some member of their community.

   c. After the students have completed their interpretive drawings, group the children into teams of 4 to 5 students. Have each team come up to the front of the room and tell the rest of the class about their pictures.

   d. At the completion of the group presentations have each student hang their drawings on the walls in the classroom; have students remain in their groups and the teacher will ask them to give their interpretations about the word Responsibility printed out in bold colors on the felt board.

e. Discuss what Responsibility means and record all responses on the black board or on chart paper. Showing the pictures used initially discuss how responsibility is related to the pictures.

6. Discussion questions:

   a. Ask students: What does responsibility mean to you?

   b. Do you feel that people in the class should act in ways that make living more pleasant for others?

   c. In what ways do you show responsibility?

   d. How important do you think it is to develop and keep a sense of responsibility?

   e. Can you think of ways that you can show responsibility in your daily living?

      Note: Here it is possible to have the students express their answers in the form of a group mural. The use of visual interpretation might enhance concept development at this point.

   f. If you plan to make any changes in the way you act towards others, please say what changes you will make.

   g. If you plan not to make any changes in the way you act towards others, please state why not.

      Note: It might be easier to achieve the total point of this exercise if the teacher would ask each group of children to express their answers in the form of a role play.

7. Follow up activities:

   a. Have students cut out pictures from magazines that reflect a sense of responsibility (a human ethic of love and understanding.)

   b. Might have class put on a presentation to the rest of school on the theme of Responsibility (a human ethic of cooperation and love.)

   c. Have students talk about their feelings about responsibility in terms of their actions towards fellow classmates, family and nature.

   d. Take students on field trip in the community to make a visual assessment of how they and their neighbors are showing responsibility towards the maintenance of a good visual appeal for their neighborhood.

Middle Elementary Nancy A. Norling

Protecting Our Water

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: If human beings protect the earth it will be able to continue to support a diversity of living things.

3. Time: approximately three weeks.

4. Materials: Children's books, large paper for wall charts, magic markers, stars, art materials, equipment for experiments.

5. Procedure and Discussion questions:

   a. List as many uses as you can think of for clean water. Children write ideas on large papers on blackboard. Use books, people, and observation for ideas.

      1) Put gold stars next to human uses to support life.
      2) Put blue stars next to human uses for enjoyment.
      3) Put green stars next to non-human uses.

   b. List as many ways as you can think of to spoil (pollute) water. Use books, other people and observation for ideas.

      1) Put yellow checks next to pollution that would affect human survival.
      2) Put blue checks next to pollution that would spoil human fun.
      3) Put green checks next to pollution that would spoil non-human life or environment.

   c. Class discuss and teacher list as many ways possible for we as individuals and families to help keep water clean. Use books, other people and observation for ideas.

      1) Every student chooses two ways to keep water cleaner: one personal project, one family project.
      2) Make individual check-off lists to follow profess of clean water project improvement for two weeks.
      3) Evaluate progress:

         a) Evaluate individually with teacher after two weeks. Modify, change or continue project as is for two more weeks.

         b) Evaluate final time. Share results with class.

   d. Draw crayon, chalk or magic marker pictures showing many ways water is polluted. Display on bulletin board.

e. Write one of the following stories:

   1) What would happen in our city if all the water slowly became unusable?
   2) What would happen in a forest if all the water slowly became unusuable?

f. Experiments:

   1) Mix water with many visible pollutants that children bring to class (sand, leaves, pebbles, oil, milk, etc.). Discuss.
   2) Mix water with invisible pollutants (salt, sugar, chlorine, other chemicals, etc.). Discuss.

g. Field trip:

   1) Visit a site where humans or human negligence are causing water pollution.
   2) Visit or have a representative from local water treatment plant explain local water supply.

h. Study map showing source of local water supply and method of disposal.

i. Collect pictures from magazines, newspapers and old texts to make a huge scrapbook showing all things that will benefit from clean water.

   1) Write one sentence under each picture telling why it matters that water is clean.
   2) Place this large scrapbook in prominent place in library.

7. References:

a. People and Their Environment, Teacher's Curriculum Guide to Conservation Education. M. J. Brennan, J. G. Ferguson Publishing Co.

b. A Multidisciplinary Teacher's Guide to Man and Environment; New Jersey Education Association.

c. Let's Try It: Girl Scouts of USA, New York.

Middle Elementary

Talbert L. Spence

Save the Spaceship

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: If human beings protect the earth, it will be able to continue to support a diversity of living things.

3. Time: 1 day or more as needed.

4. Materials:

   a. Film: Buttercup - 13 min., color, non-verbal ecology film. A rich visual experience. (1971).

   b. Chart paper and markers.

   c. Art Supplies:

      1. Mural paper.
      2. Paint.

5. Procedure:

   a. Provide each student with a handout which they are to write down the various environmental problems they see.

   b. Briefly introduce film: Buttercup, without telling students the title. 13 min.

   c. After the film showing, have the class break up into groups of 5 to compare their list of environmental problems cited in the film. Have each group develop a single list of common environmental issues cited and have each group present their list to the other teams. Teacher should record on chart paper similar environmental problems compiled by the teams.

   d. Have each group discuss the purpose of the film - what was the message to humanity - ask students why the film was titled Buttercup.

   e. Discuss that human beings must be protectors of the earth so that living things like buttercups can survive and continue to bring beauty to the world.

   f. Have students investigate the school site for any visible signs of our society misusing spaceship earth.

g. Have each group develop a mural expressing their views on how the spaceship should be managed.

h. Discuss the term pride with the class, showing how pride plays a very important role in the protection and continuation of spaceship earth.

6. Discussion questions:

   a. What does pride mean?
   b. What does nature mean?
   c. What is life?
   d. What is a flower?
   e. How did you feel about the film?
   f. Why was the film without words?
   g. Where was the buttercup going?
   h. Where did the buttercup come from?

7. References:

   Educational Films, 1973. University of Michigan.

Middle Elementary **Talbert B. Spence**

Solid Waste? What's That!!

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: Humans can be "stewards" of the earth, rather than careless exploiters of it.

3. Time: 2 or more days.

4. Materials:

    a. Garbage bags.
    b. Cameras.
    c. Films: a. The Garbage Explosion 16 min.
        b. Garbage. 11 min.
    d. Art paper and paint.
    e. Cassette tape recorders.
    f. Chart paper and markers.

5. Procedure:

    a. Introduce and show 11 minute visual essay "Garbage" to class. Use this film to intiate some discussion about who is responsible for the maintenance of the earth.

    b. After students view film ask them to relate what they saw in the film - teacher records this on chart paper - Ask class if any of the garbage shown in the movie can be found around the room.

    c. Discuss the reasons for trash in the room and in individual students desk and lockers. List responses on chart paper.

    d. Have students armed with large litter bags first clean up the the classroom of any trash, then let them loose on the hallways of the school picking up visible trash.

    e. Have students bring back to the room their trash bags and quickly investigate the contents of the litter bags. Teacher should list on blackboard the kinds of things found and place them in catagories, e.g. reusable 1) paper, 2) glass, etc.

    f. After the experimental clean up show second film: "The Garbage Explosion" 16 minute color film dealing with man's influence on his environment through technology.

    g. Discuss the issue of man's over-production has caused society to throw away valuable resources.

h. Have students divide into groups of five to do an investigation of solid waste conditions in the neighboring community. Students should have cameras and cassette tape recorder to take pictures and interview community people.

i. Have student groups gather their data for presentation to class and possibly to other students in the school.

j. Have students construct a large mural depicting solid waste problems in the school and community.

6. Suggested follow-up activities:

a. Waste glass - candle holders -art- & craft project: refer to ECO: A Handbook of Classroom Ideas to Motivate the Teaching of Elementary Ecology. by Charles E. Hamilton.

b. Anti-litter poster campaign & contest: have students develop original slogans and messages supporting an anti-litter policy in the school.

7. Reference:

a. Educational Films, 1973. University of Michigan.
b. ECO: A Handbook of Classroom Ideas to Motivate the Teaching of Elementary Ecology. by Charles E. Hamilton. Pub. Educational Services Inc., P.O. Box 219, Stevensville, Michigan.

Middle Elementary — Carol Koehn

Stewardship

1. Concept to be developed: Environmental Ethics.
2. Understanding to be developed: Humans can be "stewards" of the earth, rather than careless exploiters of it.
3. Time: 9 days - day 1 - Department of Natural Resources speaker
   - day 2 - discussion/explanation of project and parental permission forms.
   - day 3 - detailed explanations of projects
   - days 4 & 5 - pass-outs and progress check
   - days 6 & 7 - home project work continues
   - day 8 - debriefing
   - day 9 - further discussion
4. Materials: Cooperative Extension Service Basic Environmental Conservation materials, Johnny Horizon materials, DNR Forest Fire Division materials, paper bags, copies of the following:

Form A

Environmental Survey Chart

You will be looking around your house, school, and town and checking on the following things. At the end, we will add up the numbers, and you will have a score. Let's see what kind of earth being you are.

	Number of pieces —	Scale for Points (acc. to no. of pieces)	Total Points
1. Litter on street - in school -		0 - Perfect - 0 1-10 Excellent - 5 11-20 Good - 10 21-25 Fair - 50/26 + Poor - 100	
2. Garbage - messy piles - uncovered cans - construction debris -		0 - Perfect - 0 1-5 Excellent - 10 6-10 Good - 25 11-20 Fair - 50 21 + Poor - 100	
3. Defacement to road signs to walls to desks, etc. broken windows		0 - Perfect - 0 1-5 Excellent - 10 6-10 - Good - 25 11-20 Fair - 50 21 + Poor - 100	

NOW TOTAL YOUR POINTS AND USE THIS SCALE:

Perfect - 0	Fair - 56-150
Excellent - 1-25	Poor - 151+
Good 26-55	

Form B

Pollution Problems	How to Solve	Solution Actually Used

Form C

Car vs. ?

First two days - Number of times car was used

Second two days - Number of times car was used

Did the number decrease? or increase? by how much? What are your feelings?

5. Procedure:

a. Schedule a DNR speaker for classroom talk on ways people mis-use our environment (if a city school, plan field trip and incorporate talk and trip together). After the talk in the room, arrange a trip around the school area to show and have the children find destruction caused by people.

b. Review the DNR speaker's talk - emphasize things your class can control themselves.

c. Allow the children to choose one of the following activities to be completed with parental permission and help (be sure to send home project plan copies and permission slips):

1) Find a heavily littered area that you can clean up and possibly plant flowers there.

2) Take an environmental survey of your surroundings and use Form A to record your findings.

3) Find three examples of air, water, or noise pollution in your family surroundings or neighborhood and try to clear up those problems.

4) Tally two days of your families use of any motorized vehicles. Then try to suggest ways to lower this number of times used, keep another two days tally and compare to the first one. Use form C to record on.

  5) For two days tally the amount of paper and lights or electricity sources left on when not in use. Then for two days see if you can limit your waste and keep another tally.

d. After the return of the signed parental permission slips, break the children into groups according to their choice, and explain in detail their specific project also giving out the needed forms.

e. In the two day span, pass out materials and hold discussions about being 'stewards' of the earth. Also check progress and problems.

f. On the final day, collect the charts and allow enough time to completely discuss the basic concepts they found.

g. After evaluation of forms, spend one day having them share their findings - using the forms, experiences, etc.

6. Discussion Questions:

a. Did you find it difficult to complete your project? If so which part or parts?

b. Did your family help you and cooperate on your project?

c. Did you feel 'good' about doing something good for your earth?

d. Do you feel children can help to keep our country beautiful?

e. Besides these five projects our class did, how else can we be stewards of the earth/ e.g., littering, limiting destruction, recycling drives, caring for our pets and plant life.

f. What will happen to our trees if we don't take care of them?

g. What will happen to our water if we don't take care of it?

h. What will happen to our air if we don't take care of it?

i. What will happen to our soild if we don't take care of it?

j. Would it be easy to do something for our earth everyday of our lives?

k. Do you think everyone should start to care for our earth?

7. References:

Environmental Learning Experiences for Grades 3 and 4, prepared by Center for the Development of Environmental Curriculum, Willoughby Eastlake City Schools, Willoughby, Ohio.

Middle Elementary | Talbert B. Spence

Land Use In The Community

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: Humans can develop both a way of thinking and feeling about the earth if we are to live harmoniously with each other and our environment.

3. Time: Several days.

4. Materials:

   a. Cameras
   b. Chart paper and magic markers.
   c. Crayons and paper.
   d. Poster board and paint.
   e. Cassette tape recorder.
   f. Slide projector.

5. Procedure:

   a. Show students various pictures of community environmental problems. Have students discuss how these problems were created and why. Use the chart paper record and post the responses along side each picture.

   b. Ask students if there are any similar community environmental problems in the school's community; write down the responses on chart paper and also place key words that seem to come up often for possible spelling vocabular list.
      (e.g. pollution, garbage, trash, paper, pop cans, etc.)

   c. Have students in teams of six (6) survey the immediate school site for any of the suggested items in #b. Have each group take slide pictures of each problem they find.

   d. Have the developed slides of the school-site's environmental problems and show them to the class. Discuss whether the problems identified by the students are bad and if so what are some ways to change them and enhance the school's visual appearance.

   e. Discuss who might have created the problem in the beginning and who should be responsible for the cleaning up and maintaining a good school site appearance.

f. Have students draw pictures of how they would as individuals be responsible for cleaning up the environmental problems around the school site.

6. Follow up activities:

   a. Have students observe the land and housing in the neighborhood of the school.

      Ask these questions:

      1. How is land used?
      2. Is some of the area covered by concrete buildings and asphalt?
      3. Is any of the area set aside for playgrounds?
      4. Who takes care of the land?

   b. Have students observe neighborhood alleys to assess the possible or apparent effects that humans not being responsible has caused to the visual appeal of the neighborhood.

   c. Discuss what happens when rain hits the concrete and asphalt.

      Ask these questions:

      1. Does it soak in?
      2. Where does it go?
      3. What affects are there on the existing plant and animal life?

   d. Help students develop a slide show presentation on what they found during their investigation of the communities environmental problems to the total school.

   e. Assist students in putting on a play which reflects their sensitivities,fears, and awareness about the lack of human responsibility for the natural and human environments.

7. Discussion questions:

   a. What happens when it rains on concrete and asphalt?

   b. What should be the role of parents in terms of maintaining an attractive neighborhood?

   c. Do you care about the survival of existing animals and plants in neighborhood?

   d. In what ways do you show responsibility for your neighborhood?

Middle Elementary

Marion Maitland
Montel Ruble

Algae and Stream: Values

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: Humans can develop both a way of thinking and feeling about the earth if we are to live harmoniously with each other and our environment.

3. Time: Five days Day 1 - film on stream algae or visit stream with algae
Day 2 - Begin algae experiments and chart.
Day 3, 4, 5 - Observe algae experiments, record data.
Day 5 - Discuss data.

	Jar 1 water	Jar 2 water & soil	Jar 3 water soil fertilizer	Jar 4 water fertilizer
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				

4. Materials: Lawn fertilizer, 1 #, 4 glass quart jars, canning type, soil - 2 cups, measuring cup.

5. Procedure:
   a. Go to a nearby stream or pond and view algae growth or view film for effect of algae in streams to motivate interest.
   b. Discuss background information in film.
   c. Divide class into four groups.

      1) Group I prepares a jar of 3 cups water.
      2) Group II prepares a jar of 3 cups water, 1/2 cup soil.
      3) Group III prepares a jar of 3 cups water, 1/2 cup soil, 2 T. fertilizer.
      4) Group IV prepares a jar of 3 cups water, and 2 T. fertilizer.

   d. Provide a chart for each student.

      1) Record data.
      2) Record observation of jars.

   e. Discuss observation of changes in jars.

6. Discussion questions.

   a. What is algae and how is it formed?

   b. Is algae beneficial or non-beneficial to a stream according to the film?

   c. Without algae present in a stream what kinds of wildlife would be around the stream? In the stream?

   d. With algae present in a stream what kinds of wildlife around the stream? In the stream?

   e. How does the lack of game fish in a stream affect the wildlife around the stream?

   f. Discuss our charts and observations related to the experiments:

      1) Is algae present?
      2) In which jar is it most present?
      3) What jar if any does not have algae present?
      4) Is an odor present from the jars?
      5) How does the algae look?

   g. Can you draw any inferences between how we live and what we use, and how we use it? Can this affect the lives of people we don't know and wildlife we can't see which live downstream?

7. References: Deciding How to Live in Spaceship Earth. 1971. Plover Books Winona, Minnesota. Rodney F. Allen, Carmela P. Fotz, Daniel M. Ulrich, Steve Woodard.

Upper Elementary

Talbert B. Spence

Investigating Pollution Controls

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: If humans develop an ecologically sound way of thinking, feeling, and acting toward the environment, then we will be able to live harmoniously with each other and our environment.

3. Time: Several days.

4. Materials needed:

   a. Graph and Chart paper.
   b. Cameras.
   c. Cassette tape recorder
   d. Slide projector.

5. Recommended procedure:

   a. Have students take a tour in the neighborhood around the school and take pictures of what types of environmental problems they identify.

   b. Discuss with the students who are basically affected by this type of environmental problem.

   c. Discuss and identify strategies to combat the problems identified in the community.

   d. Develop with the students a plan for the collection of information on the alternative solutions to the changing of the environmental issues identified.

   e. Assist students in the development of an environmental ad campaign to inform the neighborhood of the environmental problem in the community.

   f. Have students contact several community leaders to help spear head the campaign and collection drive.

   g. Tabulate and publish these results in the local newspaper.

   h. Have students contact city officials urging them to push for stronger enforcement of existing environmental control laws and develop new ones where needed.

6. Discussion questions:

   a. How can an individual bring attention to a major environmental issue in the community to the citizens?

   b. What are the steps to problem solving?

   c. What is environmental quality?

   d. What are the duties of the Environmental Protection Agency?

   e. Who is responsible for the enforcement of local environmental pollution legislation?

   f. What is a Mass Media environmental advertising campaign?

   g. Are there any social cost in environmental pollution?

   h. Who benefits from industries over production of natural resources?

   i. What are the major forms of environmental pollution?

Upper Elementary

Joseph G. Konzer

Comparison Between Local Creek or River and Au Sable River

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: If humans develop an ecologically sound way of thinking, feeling, and acting toward the earth, then we will be able to live harmoniously with each other and our environment.

3. Time: 3 days Day 1 - film and discussion
   Day 2 - field trip
   Day 3 - discussion

4. Materials: Movie projector and screen, Movie - "The River That Came Back", Clipboards or something suitable to write on, paper and pencils. Access to local creek or river.

5. Procedure:

   a. Introduce the Au Sable River and its history.
   b. Show movie, "The River That Came Back", with discussion following.
   c. On field trip to local river or creek, have children write words positively describe the river or creek, such as "pretty" or "clear".
   d. After trip, compile the positive and negative words onto the blackboard and discuss.
   e. Lead into possible ways to change the negative feelings.

6. Discussion questions:

   a. Day 1

      1) Does anybody know where the Au Sable River is?
      2) Something happened to make the Au Sable very dirty. What was it?
      3) What the Au Sable River like before the lumbermen came?
      4) Was it the same after the lumbermen left? What happened?
      5) What did the people do to correct it?
      6) Do you think it was worth their effort?

   b. Day 3

      1) What were the positive words that you wrote about the creek (river)?
      2) What were the negative words about the creek (river)?
      3) Are there more positive or negative words?
      4) How, do you suppose, this creek (river) got negative aspects?
      5) Can you compare the creek (river) with the Au Sable? How?
      6) Was the Au Sable cleaned up? How?
      7) Can your creek (river) be cleaned up? How? By whom?
      8) Can we do something?

7. References:

   a. Film: The River That Came Back, Consumers Power Co., available through Department of Natural Resources

Upper Elementary

Gene Beach

Land Use and Protection Study

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: If we protect the earth it will continue to meet the needs of all living things, now and in the future.

3. Suggested time: 1 - 2 weeks preferably in the spring (length of time depends on the number of field trips made and follow-up activities.)

4. Materials:

For field trips.	For displays, fair booth, etc.	For school site development
notebooks and/or sketchbooks pencils, and camera	Photographs, oaktag, poster board, felt pens, tempera paints	Garden tools, trees, shrubs, outdoor plants flower seeds

5. Procedure:

   a. Fieldtrips

      1) Make arrangements for fieldtrips to following sites:

         a) Industrial plant
         b) Manufacturing plant
         c) Farm

      2) Observe first-hand and interview personnel.

         a) Take notes
         b) Make sketches or take pictures of site

      3) Evaluate fieldtrip.

   b. School

      1) Tour school site.
      2) Discuss and evaluat observations.
      3) Plan and execute follow-up activities:

         a) Hall display using photographs, charts, reports, models of sites, etc.
         b) Ecology Fair for your school.
         c) Prepare Environmental Booth for local county fair.
         d) Select, plan, and develope a school site, i.e., garden, court, nature study.

6. Discussion questions:

   a. Fieldtrips:

      1) How is the land being used by the facility?
      2) What kinds of vegetation is found on the site?
      3) What is the condition of the soil?
      4) What steps are taken to protect the land?
      5) What is used to replace the nutrients taken from the soil?
      6) What are future plans for protection of the land?
      7) What is the effect of the facility on the surrounding land?

   b. School site:

      1) How is the land being used and protected?
      2) What are the possible alternatives for land sue and protection?
      3) What steps can be taken to improve the school site?

         a). Call in DNR personnel, county or district agriculture agents and members of environmental groups such as Audubon Society, Sierra Club, an local garden club, as resource people.

7. References:

   a. Environmental Education in the Elementary School, N.S.T.A., 1972, Washington, D. C.

   b. The Do-It-Yourself Environmental Handbook, Daton Museum of Natural History, 1972, Little, Brown, and Co., Boston.

Upper Elementary

Darrell Donelson

Future Environments

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: If we protect the earth it will continue to meet the needs of all living things, now and in the future.

3. Time: 3 days - day 1 - discuss understanding to be developed. Homework: Have students work on study cards with parents.
    day 2 - Compile and chart data collected. Discuss implications of data. Show a movie to further define and help explain the understanding to be developed.
    day 3 - discuss how we can do more to protect the earth. Plan future projects.

4 Materials:

Pens/pencils	movie projector
Note Pads	screen
Construction paper/Poster board	empty wall space
movie	study cards

5. Procedure:

    a. Discuss the understanding to be developed.

    b. Give students study cards to work on at school and with parents. There should be master cards and specific area cards.

The following are examples:

MASTER CARD

As people needed or made more	People did	Results	Cures
Homes	cut down trees	erosion, animals moved	plant trees -
food	used more land	-	-
to kill insects	used poisons	-	-
materials	built factories	-	-
cars	made more	-	-
noise	construction	-	-
litter	waste materials		-
energy	-		-
gas	-	-	-
etc.	-	-	-
etc.	-	-	-
etc.	-	-	-

STUDENTS FILL IN

This card can be made up by teacher/or teacher and students. More of card done by students the better.

SPECIFIC AREA CARD		
More People Needed:	More cars.	
People Did:	Made more cars.	
Results:	Fumes put poisons into air. Trees and plants died. More Noise. Abandoned cars unsightly.	(Students fill in.)
Cures:	Engineers work to design better motors. Cleaner air helped plants and animals. More people riding bikes. Tighter laws on abandoned cars.	
Result:	When we protect the earth it will continue to meet all the needs of all living things, now and in the future.	(Teacher should put this at the bottom of all cards.)

c. Compile and chart what students have on their Master Cards.

d. Display all Specific Area Cards on wall.

e. Discuss the results of all the work the students turned in.

f. Discuss the understanding described.

g. Show a movie that goes into detail on the understanding developed. In most cases you should be able to get a quality film on this subject from local AVI sources.

h. Review what was discussed in the movie. Relate movie to the understanding.

i. Discuss how we can do more to cure and protect our environment.

j. Plan future projects:

   (1). Find out about community pollution control ordinances. Are they enforced?
   (2). Find out about local industries, government, and commercial operations concerning air pollution control.
   (3). Find out how your community gets rid of trash, garbage, and other solid wastes.
   (4). Find out about local food inspection and consumer-protection laws.

6. Discussion Questions:

   a. If we protect the earth will it continue to meet the needs of all living things, now and in the future? Explain.

b. Can you think of any things that have been done in the past that have hurt the environment?

c. What has been done to right the past wrongs?

d. What can we learn from studying the Master Cards?

e. What can we learn from the Specific Area Cards?

f. Why should we have our parents help us on this project?

g. What trends and results do you see when looking over the compiled and charted study cards?

h. How did the movie help us to develop the understanding we are studying?

i. How can we do more to cure and protect our environment?

j. Where do we go from here? What are some future projects we can undertake?

7. References:

a. There are many books on this subject in local libraries. The resource section in Book 1 lists suggestions for earth-keeping materials for students and teachers.

Junior High

Christine Rowley
Barbara Rowley

Environmental Ethics

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: The earth's resources exist for all living things, not just man.

3. Time: 5 days day 1 - field trip
day 2 - discussion
day 3 & 4 - creative work
day 5 - class presentation (may need more time)

4. Materials: Access to wooded lot and area with pond or creek.

5. Procedure:

   a. Field trip - walk around a wooded area and somewhere with a wildlife pond or creek. Students make note and list all living things that depend on 1) a tree for it's survival and, 2) a pond or creek for it's survival.

   b. Notice a tree in the school yard or backyard at home. Notice the different uses of the trees in the wildife setting and in a domestic setting.

   c. Class discussion.

   d. Students may work together or individually. Each group is responsible for presenting by play, short story, T.V. program, poetry or song, the dependence of all living things on air, water and soil.

   e. Each student will present their project to the rest of the class.

6. Discussion questions:

   a. What different animals depend on the soil for survival?

   b. How does the soil depend on plants for fertilization and protection?

   c. What is the difference in the usefulness of a tree in the woods and one in a domestic setting?

   d. From all your information, how does mankind use the soil and water resources differently than plants and animals?

   e. What kinds of things must man do when using the soil and water to prevent their destruction?

Junior High Pat Baron

Value Voting

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: The earth s resources exist for all living things, not just man.

3. Time: 1 day

4. Materials: List of questions

5. Procedure:

   a. Read aloud each of the questions in part d prefaced with "How many of you..."

   b. After each question have the students raise their hands if they vote yes and turn their thumbs down if they vote no. An undecided student should just cross his arms and any student who wants to pass should do nothing at all.

   c. The teacher should vote but wait a split second until most of the class has voted so as not to be an influence.

   d. Questions: "How many of you...

      1. would take the time to nurse a sick puppy back to health?"

      2. if given a horse, would spend 3 hours a day taking care of it?"

      3. would shoot an animal if you needed food?"

      4. would shoot a polar bear to have a nice fireplace rug?"

      5. would outlaw snowmobiles in parks because they scare animals and damage plant life?"

      6. think animals should be in zoos?"

      7. if you owned forested land, would sell it for $50,000 profit to a contractor who will cut down the trees for an apartment development?"

8. would shoot at an animal to see if you can hit a moving target?"

9. would give up half of your allowance for 3 months to help save the timber wolf from becoming extinct?"

10. If an area near you is to become either a wildlife refuge or an amusement park like Cedar Point, would want the amusement park?"

6. Discussion questions:

   a. Can homes be built without tearing down large numbers of trees? What is being done about this in the construction business today?

   b. What advantages are there to zoos?

   c. What disadvantages are there to zoos?

   d. What is the best type of zoo?

   e. Can man successfully share parks and countryside with animals and plants? Explain.

   f. Is man the only animal that kills for things besides food?

   g. What determines how your state is being developed in regards to homes, businesses, recreational areas, etc.

   h. What organizations can you name that try to help animals and plant life?

   i. What government agencies work to protect wildlife?

   j. Should off-shore oil drilling be allowed in order to give us much needed fuel even though an accident would damage much of the aquatic wildlife?

7. References:

   a. Say Goodby (movie).

   b. Values Clarification, New York: Hart Publishing Company, Inc., 1972. Sidney B. Simon, Leland W. Howe, Howard Kirschenbaum.

Junior High

Carolyn Kelley

Life Style Study

1. Concept to be developed: Environmental Ethics.

2. Understnading to be developed: Certain life styles enable man to live as a complimentary part of the environment.

3. Time: 1 - 2 days for gathering data, 1 day for discussion.

4. Materials: paper and pencil.

5. Procedure: (This activity should follow a unit on ecological problems)

   a. Discuss similarities in life styles among members of class and diverse reasons for their choices.

   b. Each student lists specific ecological problems that he sees happening around him at school (or at home).

   c. Students individually or im small groups list all the pros and cons they can think of for the stated problems.

   d. Students determine (individually) whether conditions 1) should continue, 2) should be changed completely, 3) should compromise in some way and why.

   e. Have students form small groups to share and discuss written problems alternatives, and decisions.

   f. Have each student group choose one situation and role play the situation and the consequences of that decision.

   And/Or

   Discuss in large group similarities and diversity of the decision.

6. Discussion questions:

   a. Are your life styles all the same?
   b. If there are differences, what are the reasons for those differences?
   c. How does your life style affect your decisions?
   d. How do your decisions affect your environment?
   e. Do you feel that any part of your life style should be changed?
   f. If you feel there should be changes, how could you change it?

Junior High

Pat Baron

Choosing a Life Style

1. Concept to be developed: Environmental Ethics.

2. Understanding to be developed: Certain life styles enable men to live as a complimentary part of the environment.

3. Time: 3 days -- 1/2 day the week before the project to write down outdoor values.
   1/2 day to compile list of items to sell.
   1 day to do project and compile data.
   1 day to interpret data.

4: Materials: Paper, pencil.
   List of items to sell (1 copy per student).
   Price list for these items (1 copy per student).

5. Procedure:

   a. Have each student spend 20-30 minutes listing ten things he/she likes best about the outdoors. (Not things they like to do outdoors.) Example: I like the feel of the sun: I like the room to play baseball.
   Collect and save for later.

   b. One week later spend 30 minutes with students making a list of anything they want--example: 10 speed bike, stereo, etc.

   c. Make copies of this list of items and give each student one.

   d. Set up four stores in your room.
   Store #1 will be selling spring and summer recreational equipment.
   Store #2 will be selling fall recreational equipment.
   Store #3 will have the winter recreational equipment.
   Store #4 will be a surplus store carrying anything not found in stores 1,2, and 3.

   e. Each store will be given a price list for the items it is selling.

   f. Assign 2 students to be the storekeepers at each store.

   g. Inform the rest of the class they have $2,000 to spend at these stores and they can buy whatever they want.

   h. As the students move freely from store to store whenever they desire to purchase an item, have the storekeeper circle that item and put the price next to it.
   A student's list might look as follows after two purchases:

   10 speed bike
   [✓ skiis] $150.
   sewing machine
   stereo
   [✓ tennis racquet] #70.

i. Students will continue to "buy" items until they have reached a total of $2,000.

j. Pass back the list of outdoor values compiled by the students the week before.

k. Have each student write a short paper comparing the items be bought to those outdoor features he best likes. The students should consider if, how, and to what extent their choices would disrupt any of these outdoor values.

6 Discussion Questions:

a. On your list of purchases, which item consumes the most energy? The least energy?

b. Pick any three items you bought and list what raw materials make up those items.

c. Are any of your items bio-degradable? If not, how will they be disposed of?

d. For each item you bought, determine if it is a cause of air pollution, soil pollution, and/or noise pollution.

e. What way of life would blend in best with nature?

f. What way of life would most disturb nature?

g. On the following scale, where would you place your way of life? Explain.

Little Disruption of Nature ____________________ Much Disruption of Nature

Senior High

Talbert B. Spence

Investigating Pesticide Problems

1. Concept to be developed: Environmental Ethics

2. Understanding to be developed: Only when each of us lives a life guided by respect for the earth and all living things, now and in the future, will we be able to live in harmony with each other and our environment.

3. Time: Several days.

4. Materials needed:

    a. Cameras.
    b. Cassette tape recorders.
    c. Poster board and paint.
    d. Filmstrip series: Using Natural Resources; Popular Science Audio Visuals, Inc., Times Mirror, 5235 Ravenwood Ave., Chicago, Ill.
    e. Chart paper and magic markers.

5. Recommended procedure:

    a. Visit two or three garden supply outlets to determine what pesticides are available for sale. Have students record on tape and pictures the available pesticides.

    b. Discuss and determine the amounts of most commonly used spray and dust compounds sold from these outlets within a given growing season.

    c. Have students gather information on the reasons why these particular pesticides are purchased.

    d. Have students obtain data on the possible lethal side effects these pesticides have on plant and animal life.

    e. Have students obtain information on the possible available alternative solutions to replace the toxic compounds in use. Have them find out the cost of such alternatives.

f. Contact those individuals responsible for promoting and enforcing legislation regarding the use of pesticides; ask if someone could come out and talk to your class about this legislation.

g. Develop a plan of action to disseminate information on the use of alternatives to the use of persistent pesticides; have students put on an environmental ad campaign in the school by displaying creative and informative posters around the building.

1. Have students present a slide show to school's P.T.A. on the data collected on pesticide use in the community.

6. Discussion questions:

a. Who is primarily responsible for the development of legislation on the use of pesticides?

b. Who is primarily responsible for the enforcement of legislation on the use of pesticides?

c. What is the cost of using alternative forms of pest controls other than toxic compounds?

d. What and how many different kinds of pesticides are available for sale?

Senior High

Talbert B. Spence

Housing and Social Justice

1. Concept to be developed: Environmental Ethics.

2. Understanding to be developed: An essential part of our environmental ethic is a human ethic based on social justice for all individuals and groups.

3. Time: Several days.

4. Materials needed:

   a. Slide projector.
   b. Cassette tape recorder.
   c. Cameras.
   d. Newspapers & magazines.
   e. Poster board.
   f. Chart paper and magic markers.

5. Recommended procedure:

   a. Have the students in the class do a survey on the number of students there are in the building and find out the average number of students each teacher has during a period.

   b. After the data has been gathered break up the students in teams of 5 and have them evaluate the information to see if there is any over crowding in classrooms in the building by the standards the class develops.
   (e.g. 38 students per teacher constitutes overcrowding.)

   c. Discuss the possible reasons for the overcrowded conditions, ask them whether its fair to the students to be cramped in an atmosphere that isn't good for their educational growth.

   d. Ask students if the problem of inadequate and overcrowded conditions expanded beyond the walls of the school. During this activity record each of the groups responses on chart paper and hang them around the room. Ask them to explain the reasons for the over crowding and inadequate housing in the neighborhood.

e. Take students for a walk through the neighborhood surrounding the school have the students:

  1. Identify the population makeup of the community.
     (e.g. all mon-culture, multi-culture, or pockets, of mon-culture and multi-cultures, etc.)
  2. Have students identify the types of housing in the community.
     (e.g. single dwellings, duplexes, apartments.)
  3. Have students note the number of people on the streets; look for signs of children.
     (e.g. toys, bikes, etc.)
  4. Have students note the number of cars (moving, parked, or abandoned), found on the streets.
  5. Have students take pictures of the quality of the housing, yards and streets in the community.
  6. Have a group of students recording the sounds in the neighborhood.

f. Before any evaluation of the data collected ask the students to write their interpretations of the whole experience. Allow an 1/2 hour for the completion of this assignment. Have each student discuss his/her views.

g. Using the slides taken of the community assist a group of students put together a media presentation for the rest of the class discussing the housing and living environments in the neighborhood. Have students make charts and drawings of these conditions for display, also have a group of students list and draw some alternatives to the present housing issues.

h. Have students prepare a list of major concerns created as a result of their investigations, have a person representing the housing authority and some community leaders visit the class to discuss and answer questions about the conditions of the neighborhood.

i. Using the newspapers and magazines have students cut out ads that are specifically designed to sell or rent housing in the city. Have students create a large collage of these ads for display when giving their presentation to housing officials and parents.

6. Discussion Questions?

  a. What is justice? Equal housing? Racism? Poverty?

  b. Have you seen elements of social justice in the school? In the community?

Senior High John L. Adams

What Went Wrong?

1. Concept to be developed: Environmental Ethics.

2. Understanding to be developed: An essential part of an environmental ethic is a human ethic based on social justice for all individuals and groups.

3. Time: 1 1/2-2 days

4. Materials:

   Copies of 1.) Statement on the change in environment
   2.) Population growth chart.

5. Procedure:

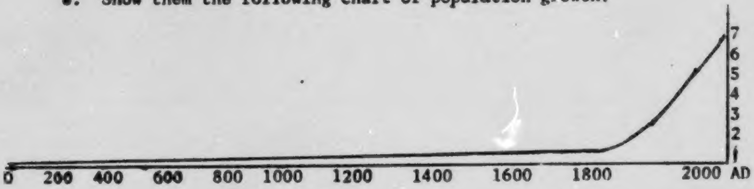
   a. Introduce the concept of an ethic, and apply results to the environment.

   b. Supply students with the following statement: When man first came on the scene, the environment was "right" and supported him and his "lower" neighbors, Something went wrong.

   c. Have them list the things they feel "went wrong."

   d. Then ask them to list the reasons why the wrong things were allowed to "go wrong."

   e. Show them the following chart of population growth.



   f. Have them write down their general reactions to the chart.

6. Discussion Questions:

   a. Discussion of reactions to chart as well as written responses to the original statement.

   b. Around the year 1800 and following, what was responsible for the increase in the birth rate? (Suggest, if they do not, the "progress" resulting from the industrial revolution in technology, medicine, and industry.)

   c. What portion of the world's population is classified as starving or suffering from malnutrition? (2/3 is)

   d. Where do you suppose the most serious conditions exist?

   e. Do any of these conditions exist here in the United States?

   f. If so, then how can we afford to send our own resources both natural and monetary, to other nations?

   g. Going back to letter "b," talk about the industrial revolution, technology, medical improvements, etc. which occured around 1800.

   h. What direct reversals came out of each area?
   Suggest some of the following:
      1. Industrial Revolution: Unfair working standards, raping the land, pollution, increased technology, larger families more desirable. Modern warfare techniques.

      2. Medical improvements: decrease in death rate due to control of disease, moral questions of abortion - etc., to control the growth of population.

   i. In what ways has "progress" justified our mistreatment of the environment?

   j. How does money affect man's use of "progress"?

   k. Is there sense in "The rich get rich and the poor get poorer?"

   l. What proposals can you make that would ensure a more equitable distribution of the world's resources to all groups?

7. References:

   a. The Hungry Planet, Georg Borgstrom, 1967, Revised Edition.

   b. Environmental Ethics, Donald R. Sooby, Ed., 1971.

   c. Circle of the World, vol. 1, 1971, Flanders.

SECTION III

SKILL DEVELOPING ACTIVITIES

SECTION III

Introduction to Skill Developing Activities

The development of problem solving skills is essential if students are going to actively participate in environmental problem solving as responsible citizens.

Nine skills have been identified as being essential to the environmental problem solving process and for each of the nine skills, skill developing activities have been designed for each of the following grade categories: early elementary (K-2); middle elementary (3-4); upper elementary (5-6); junior high; and senior high.

The nine problem solving skills are the ability to:

1. Recognize environmental problems
2. Define environmental problems
3. Listen with comprehension
4. Collect information
5. Organize information
6. Analyze information
7. Generate alternative solutions
8. Develop a plan of action
9. Implement a plan of action

After becoming acquainted with the following skill developing activities, you may want to develop some of your own, keeping in mind that they should be designed to be integrated into and coordinated with your existing curriculum rather than be used as units by themselves.

Lower Elementary

Ronald Garner
David Sandys
Richard Sandys
James Obenour

Count Nature

1. Skill areas to be developed:
    - a. The ability to collect data.
2. Time involved: 30 minutes.
3. Material needed: Count list.
    - a. How many pine needles on one hand's width of a branch?
    - b. How many petals on a dandelion flower?
    - c. How many points on a maple leaf?
    - d. How many legs on a spider?
    - e. How many bird's nests in the trees?
    - f. How many bears in the area?
    - g. How many blades of grass in one shoe length by one shoe length?
    - h. How many dead leaves under a tree?
    - i. How many ants leaving and entering an ant hill?
    - j. How many pretty rocks and how many ugly rocks are there?
    - k. How many clouds are there in the sky?
4. Recommended procedure:
    - a. Pass out count list and explain it.
    - b. Define area in which count is to take place.
    - c. Go out and make count.
    - d. Compare results and discuss natures patterns.
5. Discussion questions:
    - a. Are there things in nature that are difficult to count? Why?
    - b. Are there some things on your list that you did not find? Why?
    - c. How is nature pretty, ugly, organized and/or disorganized?

David H. Sandys
Richard B. Sandys
James D. Obenour
Ron Gardner

Lower Elementary

The Spot Game

1. Skill area to be developed:

    a. The ability to collect data.

2. Time involved - 30 minutes

3. Materials needed: Each group should have the following:

    a. An index card with a 3 inch diameter circle cut from construction paper.

    b. 100 smaller circles from the same paper made with a paper punch.

    c. A different color paper for each group.

4. Recommended procedure:

    a. Hide small circles around room before students come in.

    b. Form class into groups.

    c. Pass out an index card with the 3 inch circle to each group.

    d. Give the following directions for the exercise:

        Around the room is hidden 100 small circles the same color as the one you now have in front of you. (show several as examples).

        It is your group's job to find those 100 circles

    e. Give the groups 10 - 15 minutes to search for circles.

5. Discussion questions:

    a. Did you find all your circles? (count them and find out).

    b. Did you see circles of any other color while collecting yours? Why didn't you collect those also?

Lower Elementary

Richard Sandys
David Sandys
Ron Garner
Jim Obenour

All About Us

1. Skill areas to be developed:

   a. Ability to collect data.
   b. Ability to organize data.

2. Time involved: Two days using about 20 minutes each day.

3. Materials needed: a list of the following on the board -

   a. Number of boys in class
   b. Number of girls in class.
   c. Color of eyes - blue, brown, etc.
   d. Color of hair - black, brown, red, etc.
   e. Pets - dogs, cats, fish, etc.
   f. Number of brothers, sisters.

4. Recommended procedure:

   a. Make this a group activity by asking the students to do the counting and tabulating of this information on the board.

5. Discussion questions: Analyze the information that is gathered with such questions as:

   a. What color of hair do most students have?
   b. Are there more girls in this class or boys?
   c. What pet do most students have?

Lower Elementary

Doris Jean Jones
Blanche Edelman
Demetra Balmer

Will Our Earth Live or Die?

1. Skill area to be developed:

   a. The ability to listen with comprehension.
   b. The ability to recognize a problem.
   c. The ability to organize data related to the activity.

2. Time involved: 30 minutes.

3. Materials needed:

   a. Chalkboard
   b. Chalk
   c. Pictures showing different types of pollution should be used to help the class formulate ideas and questions to which they should seek answers or alternatives.

4. Recommended procedure:

   a. Class selects someone to write down their ideas for discussion.

   b. The teacher begins the discussion by showing pictures of pollution and asking what is pollution? She also will ask what is ecology and an environment?

   c. The children will begin to talk about both good and bad things which make our environment desirable or undesirable.

   d. The ideas of the children should be written on the board and discussed at length with the teacher acting only as a resource person. The following are examples of things to be discussed:

      1. Attitudes toward our environment.
      2. Recycling
      3. Polluting of our food, air, wildlife, rivers and land.
      4. Overpopulation
      5. Pollution by automobiles, heating fuels and factories.

   e. Some questions to be discussed involving attitudes and understanding our environment better may be as follows:.

      1. How do you feel about your environment?
      2. Are you and your family doing anything to help curb the polluting of our environment?

f. The teacher directs the class in organizing and listing their ideas in order of importance of what we should do to help preserve our earth and its resources.

5. Discussion questions:

   a. How can we get people to change their attitudes toward our environment?

   b. What would be the effect in 10 years if we stopped caring about or environment?

   c. What would be the one thing in our environment you would change if you could?

   d. Do you think that some of our ecology problems may no longer be problems tomorrrow? Why?

Lower Elementary

Doris Jean Jones
Demetra Balmer
Blanche Edelman

Becoming More Aware of Pollution Through Pictures

1. Skill area to be developed:
   - a. The ability to listen with comprehension.
   - b. The ability to recognize a problem.
   - c. The ability to organize data.
   - d. The ability to generate alternative solutions.

2. Time involved: 35 - 45 minutes.

3. Materials needed:
   - a. Newsprint or water color paper.
   - b. Crayons or water color paints.
   - c. Pictures showing pollution from previous activity for use as a model or to further ideas for new ones.

4. Recommended procedure:
   - a. Form the class into groups of two.
   - b. The pictures from the activity "Will Our Earth Live or Die?" should be used to generate new ideas or further clarify old ones on pollution.
   - c. Each group must then decide what their pictures will be about. They will do a before and an after picture using the same idea.
   - d. Each group may choose to either draw and color their pictures with crayons or to use watercolors.
   - e. Ideas for pictures that the children may use are listed as follows:

	Before	After
1.	Fish and wildlife destroyed by factory pollution to land, air and water.	Fish and wildlife living in that same area around or near the factory without harm to them.
2.	A forest damaged or destroyed by a fire from a careless camper	A healthy forest which is the home for many species of plants and wildlife.
3.	Lawns and alleys cluttered with junk and garbage.	These same lawns and alleys cleaned up by the families, neighborhood or volunteer groups.

4.	Children using the streets as a playground.	A park area set aside in the neighborhood for children to play safely.
5.	Too many unsightly signs and billboards throughout the residential area.	Few if any signs in the residential area.
6.	Too many people crowded together in the inner city.	Some of these people living out in the suburban areas of the city.
7.	Lakes and streams posted with No Fishing or No Swimming signs.	These bodies of water made safer for swimming, drinking and wating.
8.	Air pollution caused by factory smoke stacks and automobiles.	Factories which have abatement devices on their smoke stacks and automobiles using emission controls.

f. These pictures can be made into a bulletin board for use in the classroom or hallways of the school.

g. For a follow-up activity the class can reorganize themselves into larger groups and put on skits that they make up to help people become more aware of what is happening to our environment and what can be done now to help stop waste of our resources and help clean up pollution. Some of their pictures can be used in their skits.

5. Discussion questions:

a. What are some of the things that we can do to help clean up our environment right in our own community or city?

b. Why is it up to each of us to do out part in making our world a better place to live?

c. In what ways do you think that television could be used wisely in helping people become more aware of our problems with pollution?

d. Do you think that we will ever lick these pollution problems?

Lower Elementary

Tim Kreps
Donn Hellinger
Tim Kardatzke

How Fast Does it Grow?

(Comparing the growth rate of two plants)

1. Skill areas to be developed:
   - a. The ability to recognize a problem.
   - b. The ability to define a problem.
   - c. The ability to collect data.
   - d. The ability to organize data.
   - e. The ability to analyze data.
2. Time involved: growing period of a seed (bean works good).
3. Material needed:
   - a. Two glass receptacle , one for each seed.
   - b. Two seeds.
   - c. Ruler, meter stick or camera.
   - d. A dark closet or a box.
   - e. Bulletin board to display measurements or pictures.
4. Recommended procedure:
   - a. Plant each seed in a glass receptacle next to the side so that root growth below the surface may be observed (follow planting directions).
   - b. Put one receptacle next to the classroom windows.
   - c. Put the other receptacle in a dark closet or on a desk covered completely by a box.
   - d. Follow directions for watering on a seed packet, being sure to give equal amounts of water to each plant and to water both at the same time. (a good student responsibility).
   - e. As seeds grow, record growth of each. The following methods are suggested:
     1. Take pictures, a picture of each on the same day.
     2. Measure growth with a ruler or meter stick..
     3. Use different length and color segments of yarn or rope to compare amount of growth on a bulletin board.

f. Involve the class as much as possible in collecting and organizing the measurements.

g. After all data is collected and organized the teacher will lead the discussion.

5. Discussion questions:

a. Did the two plants grow at the same speed?
b. Which one grew faster?
c. Why?
d. Which one grew slower?
e. Why?
f. Both plants received the same amounts of water. Why did one grow faster than the other?

g. Did the sun help the window and garden plants to grow?
h. Would plants grow as well outside without sun?
i. Does the sun help flowers and garden plants to grow?
j. Why is the sun important to grow plants in a garden?
k. Why do we grow gardens?

Middle Elementary

James E. Smith

Pollution Sticks

1. Skill areas to be developed:
    - a. The ability to recognize a problem.
2. Time involved: 10 min. - game
   20 min. - explaining and reviewing
3. Material needed:
    - a. 31 pick-up sticks with colored markings on them.

	Sticks	Color	Points
1	Man	Black	60
5	Water Pollution	Blue	10
5	Waste	Green	6
10	Energy Crisis	Red	2
10	Air Pollution	Yellow	5

B. Object of the game: the player tries to pick up as many sticks as possible (one at a time) without moving the other sticks.

c. Add up points. The black stick may be used to help pick up other sticks.

d. Demonstrate to the students that no matter which stick they start with or collect (water, waste, etc.) the problem centers around the Black stick (man) and MAN is the one to solve the problem.

4. Recommended procedure:
    - a. Divide class into groups, 3 persons to a set of sticks.
    - b. Pass out sticks.
    - c. Follow directions to pick up sticks.
    - d. Two people watch and keep time, the other person then tries to pick up as many sticks as possible without moving the other sticks.
5. Discussion questions:
    - a. Which stick is the most important to get? Why?
    - b. When solving an environmental problem, what role does man play?

Middle Elementary

Bill Shockey

Rural, Suburban, Urban Environmental Problems

1. Skill areas to be developed:

   a. Ability to identify an environmental problem.

2. Time involved: 30 min. - 60 min.

3. Materials needed: several popular magazines

4. Recommended procedure:

   a. Look through several magazines and cut out selected pictures of a rural, suburban and urban scene in which several environmental (or potential environmental problem) problems are illustrated.

   b. Have the students view each of the pictures for a brief period of time and have them list the following.

      1. What are three things that you like about each picture?

      2. Do the pictures illustrate any serious environmental problems? Identify any problems that you see in each of the pictures:

         a)
         b)
         c)

5. Discussion questions:

   a. How can the problems be lessened?

   b. Who or what has caused the environmental problems?

   c. How many different environmental problems were identified?

   d. Why were some students more effective in identifying environmental problems than others?

Middle Elementary

Mary Garver

Homonyms

1. Skill areas to be developed:

   a. The ability to define a problem.

2. Time involved: 30 minutes-a class period.

3. Material needed: Pencil and paper for each student.
   Lists of homonyms for teacher's use.

   a. Eye
   b. Ate
   c. Dew
   d. See
   e. Two
   f. Bare
   g. Lone
   h. One
   i. Male
   j. Pane

4. Recommended procedures:

   Read the list to the class as you would a spelling test; however, do not use any of the words in a sentence.
   After the list has been read, reread the same words in the same order but this time use each word in a sentence which makes clear which homonym is asked for. Have the students rewrite any words they misused.

5. Discussion questions:

   a. Did you need to change any of your words the second time you heard them?

   b. Why?

Middle Elementary

David H. Sandys
Richard B. Sandys
Ron Garner
James D. Obenour

Data Collection Through Drawing

1. Skill area to be developed:
   - a. The ability to collect data.
2. Time involved: One hour.
3. Materials needed: Each person should have the following:
   - a. A sheet of drawing paper folded into thirds each way to make nine sections.
   - b. A pencil
   - c. Crayons
4. Recommended procedures:
   - a. Have a selected list of alphabet letters on the board.
   - b. Have pupil write one letter in each square on his paper.
   - c. Give the following directions for the exercise.
     1. Go outside and find something that begins with the letter you have put in each square on your paper.
     2. Draw a picture of the thing you find for each letter.
     3. Print the name of the item drawn in the square under the drawing.
5. Discussion questions:
   - a. Tell the class about one of the things you have drawn
   - b. Did you draw things you like or dislike? Why?

Middle Elementary

Blanche Edelman
Doris Jones
Demitra Balmer

P.S.
(Pollution Statements)

1. Skill area to be developed.

   a. The ability to organize data.

2. Time involved: 30 minutes

3. Material needed: Sheets with the following environmentally related statements:

   a. Many people like to burn their leaves in the fall of the year.

   b. In spite of warnings about danger to one's health, many people still smoke cigarettes.

   c. It's very warm out today.

   d. While driving to work I saw several people throw gum wrappers, cigarettes or other trash on the sidewalk.

   e. The car ahead of my car had heavy black exhaust coming from its tail pipe.

   f. I saw a robin this morning.

   g. Many ads encourage people to use low phosphate soap powder for washing clothes.

   h. Some industries dump sewage in nearby waterways.

   i. As we looked through the windows we saw lots of smoke coming from the smoke stacks.

   j. There seemed to be oil slicks on the water.

   k. The record player was way too loud.

   l. The muffler needed replacing.

   m. The windows were opened and the machinery sounds could be heard a block away.

   n. They were already sorry they had built their house so close to the airport.

   o. She used a great deal of pesticide spray.

p. He was putting new filters in his furnace.

q. It was a good band but we couldn't talk while they were playing.

r. The parking lot is crowded today.

s. She was shaking her dust mop from the window.

t. We saw many dead fish on the beach.

4. Recommended procedure.

a. Give each member of the class a sheet containing the above environmentally related statements.

b. Allow 10 minutes for reading over list and adding their own statements which could concern any area of the environment or be an irrelevant statement.

c. After 10 minutes, divide the class into groups of five.

d. Give the following directions:

1. In each group one member will record air pollution, problems, one water pollution problems, one noise pollution, one all other environmental problems, and one irrelevant statements.

2. Each one taking a turn, the statements will be read and the group decides where it should be recorded. The record is kept on the statement sheet by placing a check in front of that statement.

(Ex. Statement "a" would be checked by the Air pollution recorder).

f. Continue until all statements have been read or until time has been called.

g. Check answers for first 20 statements.

Air - a, b, e, i, o, p, s, l - may be either air or noise.

Water - g, h, j, t.

Noise - k, m, n, q.

Other - d

Irrelevant - c, f, r.

h. Start with group (1) and have the Air Pollution person read one of his added statements. See if any other group had something similar.

i. In group (2) do the same for a water related item.

j. In group (3) use noise statements.

k. In group (4) use other types of pollution.

l. In group (5) use an irrelevant statement.

m. After each group has given one, talk about how controversial statements were dealt with.

5. Discussion questions:

   a. Did you have any problems deciding where statements should be grouped?

   b. What questions did the students have regarding some of the statements?

Middle Elementary

Doris J. Jones
Blanche Edelman
Demetra Balmer

Five-in-One

(Five groups of words are combined to form a master list which is arranged alphabetically).

1. Skill area to be developed:
   - a. The ability to organize data.
2. Time involved. 45-50 minutes
3. Materials needed:
   - a. Paper
   - b. Pencils
   - c. Printed cards containing all the words covering the five topics (i.e., things found in a city, in an automobile, at home, at school, and on a farm).
   - d. A master list arranged alphabetically is attached to the end of this paper.
4. Recommended Procedure:
   - a. Divide the class into groups of five.
   - b. Each group selects a captain who will oversee the final alphabetical master list.
   - c. Each participant will decide which topic he/she will work on.
   - d. Each participant is then given 15 minutes to find all the words from the pile (which is located in the center of the group) that belongs to his particular topic and arrange these alphabetically.
   - e. The next 20 minutes are set aside so that all words can be combined to form the alphabetical master list.
   - f. The last 5 minutes will be a discussion period involving all participants of the group.
5. Discussion questions:
   - a. How did the organizing proceed at the beginning of the group? Such as:

1. Selecting a captain.
2. Deciding who should get a topic if more than one person wanted it.

b. Did you find that some words could belong to more than one list? If so, who made the final decision to what group the word should belong?

c. Did the group function well together?

d. If you were to find yourself in this type of situation again, what would be some of the changes you feel could be improved or eliminated?

e. Did you enjoy the game?

This is an alphabetical list of all the words used in the game. A number after a word indicates the possible number of times that particular word should be printed for use in one of the five main topics.

Aide
Air-conditioner 4
Airport
Alley
Apartment
Ash tray 2
Avenue
Barn
Basement 2
Battery
Bed
Bell
Blinds 2
Blinkers
Bookcase 2
Books 2
Brakes
Bridges
Cabinet 2
Car 4
Carburetor
Carpet 3
Cat 3
Chair 2
Chicken
Children 3
Church
Cinema
Class
Closet
Clothes line
Cookware
Couch
Crowds 2
Cylinder
Defroster
Desk 2
Dishes
Dog 2
Door 3
Drapes 2
Dress
Drinking fountain
Driveway
Duck
Expressway
Filmstrip
Filter
Flower garden 4
Food 3
Freezer 3
Fruit tree 2
Garage 2
Gasoline
Gear-shift
Gutter 2
Hallway
Headlight
Headphones
Headrest
Heater
Hen house
Hood
Horses
Houses
Hub caps
Ignition
Jail
Lakes
Lamp
Lawn 3
Lighter
Lunch room
Mailbox
Mats
Mirror 3
Motor
Movies
Mowers
Offices
Oil
Paintings 2
Paper
Parents 2
Parking lot 2
Park
Pencils 2
Pets 2
Pictures
Pigs
Plants 4
Playground
Policemen
Pollution
Ponds
Porch
Post office
Principal
Projectors
Radiator
Radio
Railroad
Record players 2
Refrigerator
Restroom
River
Ropes
Safety belts
Safety building
School
Seats
Shades
Shade trees
Shopping centers
Sidewalks 3
Silo
Silverware 2
Spark plugs
Stage
Steering wheel
Stereo
Stop signs
Stove
Streams 2
Street curves
Street lights
Tables 2
Tape players 3
Teachers
Telephones 4
Televisions 2
Theater
Tires
Tool shed
Tractor
Traffic lights
Traffic signs
Trampoline
Trees 4
Trunk
Turkeys
Vegetable garden 2
Vents
Vinyl
Volleyball
Volunteers
Windshield

Middle Elementary

Tim Kardatzke
Tim Kreps
Don Hellinger

Weather Chart

1. Skill area to be developed:

    a. The ability to analyze data.

2. Time involved: 30-45 minutes.

3. Material needed: One sheet of paper with the same data as the "classroom weather chart" for each student.

    For a period of one to two months prior to the weather unit, the class, with the aid of the teacher will compile a weather chart. This chart should be large and prominently placed on a wall or bulletin board. Data, collected at 8:30 AM, 11:00 AM, and 3 PM daily, will include temperature, and cloud cover (sunny, partly cloudy, overcast, rain, snow). The temperature readings are recorded as a line graph, with the sky conditions printed below each temperature.

4. Recommended procedure:

    a. Form the class into groups of six.

    b. Pass out the sheets for each with the weather chart (one sheet for each member of the group).

    c. Give the following directions:

        1. The weather chart on your paper is the same as the one we have been making for the last two months.

        2. Try to decide if the temperature changes when the amount of sunshine changes.

    d. Give the groups time to explore the general question while you visit each group to answer their questions.

    e. Call the class to order so they can share their ideas.

    f. Ask any group to tell if the days have geen getting warmer or cooler since the first readings were taken.

    g. Ask if one time of the day was usually warmer than other times.

    h. Ask if a cloudy day was much warmer or cooler than the next sunny day.

    i. Ask if the temperature became higher or lower when it rained or or snowed.

j. Analysis of the data should bring forth the following ideas:

1. Temperatures get higher in the springtime or the temperature gets lower in the fall (depending on when the chart is made).
2. Temperatures are warmest in the afternoon.
3. Cloudy days don't get as warm as sunny days.
4. Sometimes the temperature goes down when it rains or snows.

Middle Elementary

Erv. Doman
Bill Plummer
Cim Murnen

Tools of Your Trade

1. Skill areas to be developed:

   a. Ability to work with a group.
   b. Ability to develop alternatives.

2. Time involved: 30 minutes

3. Materials needed: Cards of Worker and Tool:

   Card #1 - Worker is a teacher; tool is a book. List other tools a teacher may use.

   Card #2 - Worker is a carpenter; tool is a hammer. List other tools a carpenter may use.

   Card #3 - Worker is a secretary; tool is a typewriter. List other tools a secretary may use.

   Card #4 - Worker is a cook; tool is a pancake turner. List other tools a secretary may use.

   Card #5 - Worker is a painter; tool is a paint brush. List other tools a painter may use.

   Card #6 - Worker is a school custodian; tool is a dust mop. List other tools a school custodian may use.

4. Recommended Procedure:

   a. Form groups of six students.
   b. Provide each member of a group with one card.
   c. Give the following directions for the exercise:

      (1). Each member of a group is to list as many alternate tools as possible on his card.
      (2). Members may switch cards when they have exhausted their own resources.
      (3). Set a time limit for the exercise.

5. Discussion Questions:

   a. How was the leadership of a group established?
   b. How were decisions made?
   c. Was a time limit set for each member for his card?
   d. How was decision made by the group whether the list of tools on the cards were appropriate to the worker?

Middle Elementary

Charliemae Rose

Terrariums

1. Skill area to be developed:

   a. The ability to make observations.
   b. The ability to draw conclusions.

2. Time involved: approximately 2 weeks.

3. Materials needed:

   a. soil
   b. small plants
   c. jar
   d. cork or plastic wrap
   e. water
   f. pebbles
   g. charcoal
   h. tag board
   i. tape
   j. spoon
   k. popsicle sticks
   l. rubber bands
   m. tweezers
   n. hanger

4. Recommended procedure:

   a. Have each child make his own terrarium, if not, have the class make at least two. (Wide necked containers like peanut butter or mayonnaise jars are easier to handle. The bottle must have a covering a cap, a glass plate, plastic wrap, or a cork.)

   b. Using the funnel,pour a layer of pebbles (for drainage) into the bottle and add a few bits of charcoal to keep the garden odor-free. In a small bottle, the depth should be an eighth to a quarter of an inch; in large bottles, it can be two or three inches. Shake the bottle to spread drainage evenly. Then pour in a commercial sterilized soil to a depth of at least a half-inch in small bottles and as much as three or four inches in larger ones. If commercial sterilized garden soil is not available, use any fine soil to which fine sand has been added. Spread and pack the soil with a tamper (cork attached to a piece of wood). With a shovel (spoon) dig a hole for each plant. Lower each plant carefully into the bottle. When the garden is planted, pour water through the funnel until the water level reaches the top of the drainage material. Place a cover on the bottle. If the soil surface is dry the following day, add more water. If the glass sides are covered with water drops, there is too much water, and the top should be removed for a day. Repeat this procedure until a light vapor appears only at night. Never set the bottle garden in direct sunlight.

c. Have the children observe the terrariums over a period of two weeks. Ask the class to make a list of the elements in their terrariums that seem to work together cooperatively. Bring to the class's attention that once the terrariums are air-tight, the elements must depend on each other in order for the plants to survive. For example, the sunlight helps the plants to grow and make food. During the process of making food, oxygen is created. The soil not only holds the plants upright, but also provides the nutrients necessary forthe plant to make food. Water is used by the plants. During the food-making process, water is given off in the form of water vapor. This vapor condenses and returns to the soil to be used again.

d. After two weeks have some students who volunteer cause an upset in their terrariums by using one of the following conditions:

1. Have a few students pinch off parts of leaves. (Equate this experiment with students climbing trees and breaking off branches.

2. Ask one student to place too much water in his terrarium.

3. Ask another student to stop watering.

4. Ask a student to use polluted water in his terrarium (soap).

5. Have another student place litter in the terrarium.

Allow the class to observe these upsetting conditions.

5. Discussion questions:

a. Where do the plants get water?
b. How can the plants make food?
c. What effect does the students' disruptions to the terrariums have on the plants?
d. What effect do students have on the trees and shrubs on the school grounds?
e. How can balance to the terrariums be restored?

References:

The Toledo Blade, Sunday Home Section, 1974, (February)

Middle Elementary

Tim Kreps
Donn Hellinger
Tim Kordazke

How Fast Does it Grow?
(Comparing the growth rate of plants in different environments)

1. Skill areas to be developed:

   a. The ability to recognize a problem.
   b. The ability to define a problem.
   c. The ability to collect data.
   d. The ability to organize data.
   e. The ability to analyze data.

2. Time involved: Growing period of a seed (bean works well).

3. Materials needed:

   a. Six glass receptacles, one for each seed.
   b. Six seeds.
   c. Ruler, meter stick or camera.
   d. A dark closet or a box.
   e. Bulletin board to display measurements or pictures.

4. Recommended procedure:

   a. Plant each seed in a glass receptacle next to the side so that the root growth below the surface may be observed. (follow planting directions).

   b. Put 2 receptacles next to the classroom windows.

   c. Put 2 receptacles as far away from outside light as possible (the other side of the room, etc.).

   d. Put 2 receptacles in a dark closet or on a desk covered completely by a box.

   e. For convenience label the plants: window plants A & B, room plants A & B, box plants A & B.

   f. Follow directions for watering the three "A" plants, being sure to give equal amounts of water to each "A" plant and to water all three at the same time.

   g. Water the three "B" plants when the three "A" plants are watered but give each "B" plant only half the amount of water that each "A" plant receives.

   h. Measuring and watering are good student responsibilities.

   i. Form the class into 6 groups.

   j. Each group is responsible to measure the growth of one of the plants. They are to record and organize their information.

k. The teacher may not want to divide the class into groups. In that case, students should rotate the responsibility of recording the plants' growth rate.

l. As seeds grow, record the growth of each. The following methods are suggested:

    1. Take pictures, a picture of each on the same day.

    2. Measure growth with a ruler or meter stick.

    3. Use different length and color segments of yarn or rope to compare amount of growth on a bulletin board.

m. After all data is collected and organized, the teacher will lead the discussion.

5. Discussion questions:

    a. What have we learned about the growing conditions of a plant?
    b. What makes a plant grow slower or faster?
    c. Which one grew faster? Why?
    d. Which one grew slower? Why?
    e. All "A" plants received the same amount of water. Why didn't they all grow at the same speed?
    f. Is water the only thing necessary for a plant to grow?
    h. What else is needed?
    i. Did the sun help window plant "A" to grow faster than the other two "A" plants?
    j. Did window plant "B" grow as fast as window plant "A"?
    k. Does the amount of water a plant receives help it to grow?

Note: Discussion suggestions:

1. Discuss as an entire class.
2. Form discussion groups of 5 to 6 students and give them discussion question "a" and also question "b", depending on the group). Ask someone to record their thoughts (either on paper or a tape recorder) so that they can share their ideas with the other groups. The teacher will want to move around the room asking further discussion questions of those groups who are having trouble getting started.

Middle Elementary

Ervin Doman

Resource Problem

1. Skill areas to be developed:

    a. The ability to recognize data.
    b. The ability to organize data.
    c. The ability to analyze data.
    d. The ability to make group decisions.
    e. The ability to provide alternate solutions.

2. Time involved: 30 minutes

3. Materials needed: Information supplied on a printed sheet of paper.

    a. Data: A family has two boys, two girls, a mother and father and a grandmother.
    The mother sews for everyone; she has a large sewing machine.
    One of the boys likes to do wood carving.
    One of the girls and the other boy like to sing and play the guitar.
    One girl is practicing to be a cheer leader.
    Grandma needs to rest a good deal.
    Father works from 4 p.m. until midnight, and sleeps from 2:00 a.m. until 9:00 a.m.
    Their house has three bedrooms, one living room with a fold-away bed, a kitchen with a dining area, and a bathroom.

    b. Problem: How can people in this family plan their use of space so that each person can do what he or she needs to do and wants to do?
    Where and when will each eat, sleep, work and enjoy his activities?
    List as many alternative solutions as you possibly can when you solve the problem.

4. Recommended procedure:

    a. Form the class in groups of 4 or 5.
    b. Pass information to each group.
    c. Give the following directions for the exercise:

        (1). Each group solve the initial problem.
        (2). Each group assign a recorder for the group.
        (3). Each group try to have at least one alternate solution to the problem.

5. Discussion Questions:

    a. How was the recorder chosen?
    b. How were the decisions made?
    c. Did all members contribute to solutions?
    d. Were alternative solutions easy to find? Why?

Middle Elementary

James E. Smith
Gary Sample
Gussie Hawkins

Lunch Room Substitutes

In the elementary schools, the hot lunch program has brought about many changes. Since the schools were not built with cafeterias, auditorium and physical education facilities have been used for food service.

1. Skill areas to be developed:
    - a. The ability to listen with comprehension.
    - b. The ability to recognize useful data.
    - c. The ability to collect data.
    - d. The ability to analyze data.
    - e. The ability to organize data.
    - f. The ability to draw conclusions.

2. Time involved: At least five class periods.

3. Material needed: paper, pen or pencil, cleaning tools.

4. Recommended procedure:

    - a. The class lists problems to be solved involving cleanliness of P.E. - Lunchroom area.

    - b. Have students discuss the most important problems in this area.

    - c. Divide class into groups to discuss what they can do to help solve the problems.

        1. Proper disposal of garbage.
        2. Spillage.
        3. Plan ways to use lunch materials in class projects.
           (Ex. Foil tops for language lessons.
           Plastic ware for art.
           Straws for math counters.
        4. Student attitude towards lunchroom behavior and general control.

    - d. Suggest to teachers that all classes make this a unit topic.

    - e. Have students view cafeteria after lunch to see what it looks like.

6. Discussion questions to be developed according to age or grade level.

Middle Elementary Gary R. Samples

Earning Money

1. Skill areas to be developed:

    a. The ability to listen with comprehension.
    b. The ability to recognize a problem.
    c. The ability to define a problem.
    d. The ability to organize data.
    e. The ability to analyze data.
    f. The ability to develop a plan of action.
    g. The ability to implement a plan of action.

2. Time involved: 20-30 minutes.

3. Material needed: Four information cards.

    a. Card #1

    YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

    We need some way to earn money for our class project. How can we do it?

    1. Recycled glass sells for about half of what paper does.
    2. There are 38,400 aluminum cans in a ton.
    Some of the information provided may not be needed.

    b. Card #2

    YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

    1. Maybe our parents will give us the money.
    2. Glass is too dangerous to handle.
    3. Every ton of paper we collect will save 17 full-grown trees.
    Some of the information provided may not be needed.

    c. Card #4

    YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

    1. How about a bake sale?
    2. Aluminum sells for $300 a ton, but paper only sells for about $40.00 a ton.
    3. Paper and aluminum are things we can safely handle.
    Some of the information provided may not be needed.

d. Card #4

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP.
YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

1. We could recycle something like paper, aluminum, or glass for cash.
2. A ton is 2000 pounds.
3. Aluminum needs a lot less electrical power when it is recycled.

Some of the information provided may not be needed.

4. Recommended procedure:

   a. Form the class into groups of four.

   b. Pass out the information cards - one to each member of the group.

   c. Give the following directions:

      1. One member in each of the groups has a question to be solved by each group.
      2. Participants may not show their card to anyone.
      3. Participants may read the information on the card to anyone in their group.
      4. Some of the information on the cards is not necessary.

5. Discussion questions:

   a. What problems will students have in organizing a drive for paper and aluminum?

   b. Where will they get the paper and aluminum?

   c. Can they make money with such a project?

   d. What community resources can they use to make their drive a success?

   e. Will students help the environment at the same time they earn money?

Middle Elementary

Charliemae Rose

Paper Drive and Recycling

1. Skill area to be developed:

   a. The ability to develop a plan of action

2. Time involved: 6 weeks

3. Personnel needed: Committee composed of:

   a. 2 representatives from each classroom,
   b. 2 Parent Volunteers
   c. 1 representative from the Mother's Club,
   d. 1 representative of the P.T.A.,
   e. Principal.

4. Recommended procedure:

   a. Each classroom will elect 2 class members to represent them at a meeting of the Committee. (Weekly Meetings)

   b. The Principal, a representative from the Mother's Club, the P.T.A. and two Parent volunteers will be invited to a meeting at school.

   c. The elected class members will report the results of each meeting to his or her class. Ask for class ideas.

   d. Possible areas to be explored:

      1. Paper drive for recycling.

      2. Anti-litter posters made by the school children could be placed in the corridors.

      3. Each child could volunteer to keep an elderly couple's yard litter-free.

Middle Elementary

Charliemae Rose
Bill Werick
Leslie Green

Togetherness

1. Skill area to be developed:

   a. The ability to develop a plan of action.

2. Time needed: Approximately 1 week (1 project per day for 45 minutes)

3. Materials needed:

   a. Roll of narrow shelf paper
   b. Short stick
   c. Crayons
   d. Board
   e. Ball
   f. Bell
   g. Candy recipe
   h. Blocks (several for each child)

4. Recommended Procedure:

   a. Classroom Movie

      (1). This will be a classroom movie which tells the story of littering the school yard. On the narrow shelf paper, draw pictures one under the other beginning with one student dropping one piece of litter, in subcequent pictures add more litter per student. Write short captions under the pictures. Fasten each end of the paper to a short stick.

      (2). Show the "movies" to each class.

   b. Dialogue

      (1). Have two children hold the ends of a board and balance a ball resting on the board. Have them walk from one side of the room to the other, keeping the ball in balance. If the children work together cooperatively, the ball will remain balanced.

      (2) Demonstrate this dialogue in each classroom. Then discuss cooperating to keep the lawn free of litter.

   c. Role Play

      (1). Mock Fire Drill

      Choose eight to ten of the less vigorous students and and have them role play a fire drill in which everyone pushes and rushes to get to the door first.

Then allow eight or ten other students to role play the correct way to conduct a fire drill.

(2). Have students discuss why it is important to have groups work cooperatively together.

d. Candy-making

(1). Do this actual procedure in the classroom. This allows the students to see that ordinary everyday activities often involve cooperation. Cooperation is necessary in two ways: obtaining the ingredients and following directions.

e. Dialogue

(1). Give each child several blocks and ask the class to cooperate to build a balanced structure. Have the children take turns adding blocks. After each child has had a turn to add a block, ask what would happen if someone removed one of the blocks. Point out that the removal of almost any one of the blocks would cause the structure to become unbalanced. Thus the blocks are in a way cooperating.

(2). Equate this dialogue with keeping the lawn litter-free.

5. Discussion Questions:

a. What are some things your parents, brothers, sisters, teachers, classmates, and friends can accomplish through cooperation?

b. How do you think you can help in this project? Why?

c. How do you feel when you cooperate with others?

d. Cooperation is fun because . . . .

e. Tell some other ways that cooperation could help improve our environment in the classroom, in the school, and at home.

Upper Elementary

James Obernour
Ron Garner
Dave Sandys
Dick Sandys

Bang, Ring and Do Re Mi

1. Skill areas to be developed:

   a. The ability to collect data.
   b. The ability to organize data.
   c. The ability to analyze data

2. Time involved:

   a. 1st. day; 30 minutes (Parts 4a-4d)
   b. 2nd. day; home survey (Part 4e)
   c. 3rd. day; 45 minutes (Parts 4f-4g)

3. Materials needed: Class made survey sheets

   EXAMPLE:

SOUNDS	LIKE	DON'T LIKE	LOUD BUT NEEDED
School bells			
Wind blowing			
Car brakes squealling			
Birds singing			
Police sirens			
Children playing			
Soft music			
Noon whistle			
Rock music			

4. Recommended procedure:

   a. Divide class into small groups.
   b. Have students make a list of sounds they like to hear.
   c. Make a list of sounds they don't like to hear, and a list of loud but needed sounds.
   d. Develop a survey list from the students lists. Be sure to mix up like, don't like and loud lists. Include a place for the people being surveyed to add their own sounds.
   e. Take a survey of parents and other students.
   f. Make a graph to show results of survey.
   g. Analyze data.

5. Discussion questions:

   a. What sound was liked and disliked by most people? Why?
   b. Are some sounds problems?
   c. Does our survey represent the feelings of most people?
   d. Does our survey list all the sounds?
   e. Can we improve our survey?
   f. What should we do with the data we have gathered?

Upper Elementary

David Sandys
Richard Sandys
Ron Garner
James Obenour

Introductory Data Collecting Exercise

1. Skill area to be developed:

    a. The ability to collect data.

2. Time involved: 30 minutes.

3. Materials needed:

    a. Question Sheet:

Question Sheet

1. Title of book:
2. Author of book:
3. Publisher of book:
4. Copyright date:
5. Does the book have an index? If so, where located?
6. Does the book have a glossary? If so, where located?
7. Does book have a table of contents? If so, where located?
8. How many chapters?
9. Which chapter is longest? Which one is shortest?

    b. Textbook

4. Recommended Procedure:

    a. Give each person a question sheet.
    b. Give the following directions for the exercise:

        (1). Answer the questions on the answer sheet using your textbook as a resource.

    c. Give each person about 15-20 minutes to fill in his answer sheet.
    d. Discuss correct answers.

5. Discussion Questions:

    a. None. The answers to this simple introductory exercise and its immediate feedback of correct answers should help greatly in future data collection activities.

Upper Elementary

Blanche Edelman
Doris Jones
Demetra Balmer

Fill It Up
(Survey of Use of Cars and Buses)

1. Skill areas to be developed:

   a. The ability to collect data.
   b. The ability to organize data.

2. Time involved: one week using 1 1/2 hours per day.

3. Material needed:

   a. Paper for collecting data.
   b. Squared paper for tabulating data.

4. Recommended procedure:

   a. Divide the class into four teams. Tabulate the size and number of cars and buses passing corners of the school and the number of people in each vehicle. Team will work in groups of two - one will observe and count, the other will record. Each pair will record data as small cars, large cars and buses, the number of passengers in each. All teams use the same code: S 1 (small car and driver only) S 3 (small car, driver and two passengers) L 2 (large car and two people) BL (Bus light load) B F (Bus full load) etc.

   b. For more accuracy, different times of the day should be used and several days ought to be used for sampling.

   c. The whole class should have a briefing session before the tabulating is done so that all are in agreement on code used and how to judge the fullness of bus and size of car.

   d. When teams return they will record their data on nine different master sheets. Example:

      1. Friday 8:30 - 8:50 a.m.
      2. Friday 10:45 - 11:10 a.m.
      3. Friday 12:30 - 12:50 p.m.
      4. Monday 8:30 - 8:50 a.m.
      5. Monday 10:45 - 11:10 a.m.
      6. Monday 12:30 - 12:50 p.m.
      7. Tuesday 8:30 - 8:50 a.m.
      8. Tuesday 10:45 - 11:10 a.m.
      9. Tuesday 12:30 - 12:50 p.m.

e. On the day that organizing of data is to be done, form the class into nine groups. Each group will take one master sheet of data and organize it by counting each classification. Example: S1; S2 or 3; S4 or more; L 1; L 2 or 3; L4 or more; B L; B M; B F. Total of tabulations should equal total of cars listed. When each group finishes the count and checks, the talleys can be put on squared paper and some totals can be figured.

5. Discussion questions:

   a. Can you form any conclusions about how people are using their cars?

   b. Can you suggest some ways we can use cars and buses to economize or save gasoline?

   c. Did you have any difficulty with the collecting of data? If so, can you suggest how the method can be improved?

   d. Did you meet with any reactions from people as you collected your data?

   e. Did you find any better way to organize your data which you could share?

   f. Did you have any difficulty in working together?

Upper Elementary

Demetra Balmer
Blanche Edelman
Doris Jones

Turn Off That Radio
(Relationship of Noise to Learning)

1. Skill to be developed:

   a. Ability to organize data.

2. Time involved: one hour

3. Materials needed:

   a. Record player and recording of raucous music (rock?) or radio tuned into local rock station.

   b. Have at least 12 sheets of construction paper (12 x 18) on which you have pasted at random: circles (2 1/2 in. diameter) squares (2 1/2 in.), and triangles (2 1/2 in. sides) cut from different colored construction paper (see sample). (This could be done by students some weeks before as an art project or math symbol identification project) or 8 to 10 transparencies on which you have drawn circles, squares and triangles in different colors.

   c. Tally sheet for student data.

   d. Clock or watch with second hand.

4. Recommended procedure:

   a. Divide class into groups of 6 or 8 students, giving each student a tally sheet.

   b. Put four of the figured construction paper sheets on table in center of each group, face down; select one student to turn over a sheet at teacher's signal.

   c. Instruct the class in a manner similar to this: I would like to see how well you can remember what you see. I am going to show you different colored circles, squares and triangles. Write down the number and color of each that you see. We'll play some music for background as we go through this exercise.

   d. Turn on the record or radio loudly.

   d. Give signal for figured side to be shown.

   f. Wait 20 seconds and tell student to turn over sheet. (these can be set aside for exchanging later)

g. Give students a few seconds to write down what they saw.

h. Give signal to turn over each succeeding sheet allowing 20 seconds exposure for each sheet until all four sheets have been shown.

i. Swap sheets from one group to the next and turn off radio.

j. Go through exercise again (no noise).

k. Exchange sheets again and go through with no noise the second time.

l. Turn on radio again and exchange sheets; go through exercise again. (Noise is last in order to eliminate the possible advantage of experience).

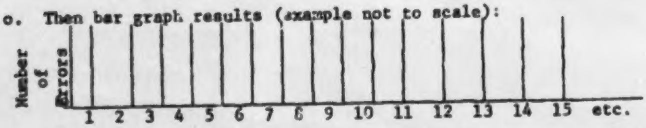
m. Have students check their results, noting the number of mistakes per page. Example:

sheet 1	5 mistakes
sheet 2	8 mistakes
sheet 3	7 mistakes etc.

n. Ask each group to organize data by adding their individual scores for total errors for each sheet: example:

sheet 1	27 mistakes
sheet 2	35 mistakes
sheet 3	45 mistakes etc.

o. Then bar graph results (example not to scale):



p. A master graph could also be made showing results of entire class.

5. Discussion questions:

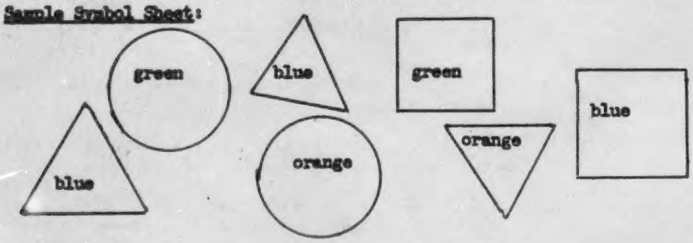
a. What does the graph show us?
b. What could have made the difference in the number of mistakes made
c. Can you think of other times that noise makes a difference in your life?
d. Should you study with the radio playing?

Variation - have students count number of circles, squares and triangles. without differentiation of color. Cut down time to about 5 seconds.

TALLY SHEET

Sheet #	Squares				Circles				Triangles			
	Total	Red	Green	Blue	Total	Red	Green	Blue	Total	Red	Green	Blu
1												
2												
3												
4												
5												
6												
7												
8												
9												
10.												
11.												
12.												
13.												
14.												
15.												
16.												

Sample Symbol Sheet:


green
blue
green
blue
blue
orange
orange
blue

Upper Elementary
(Students Must Know How
To Read Bar Graphs)

Tim Kreps
Don Hellinger
Tim Kardatzke

Hot, Cool or Cold?

(Air & Water Temperature of Lake Environment)

1. Skill area to be developed:

   a. The ability to analyze data.

2. Time involved: 30-40 minutes.

3. Materials needed: One sheet of paper with two bar graphs represented (one for each student).

   a. Bar graph #1

      Shows the temperature of the air a few inches from the lakes surface on different days.

   b. Bar graph #2

      Shows the temperature of the lake taken the same days and at the same time the air temperature was taken.

4. Recommended procedure:

   a. Form the class into groups of five.

   b. Pass out the sheets with the two bar graphs represented (one sheet for each member of the group).

   c. Give the following directions for the exercise:

      1. Each group member has the same information on their information sheet.

      2. Notice that there are two bar graphs on your information sheet.

      3. The readings for the air temperature graph were taken a few inches above the surface of the lake.

      4. The readings for the water temperature graph were taken a few inches below the surface of the lake.

      5. What can your group learn from these graphs? Someone in your group may want to take brief notes so you will be able to remember your ideas in a little while.

d. Give the groups a few minutes to bring forth some ideas. During that time the teacher (and aides) will circulate among the groups. If, after giving a group 3 to 5 minutes, they have not begun to generate any ideas whatsoever, then suggest one or more if necessary "idea stimulators" found below. Hopefully one or two "idea stimulators" will ignite the group and they will continue with ideas on their own.

e. Give the groups about 15 minutes to generate ideas from these graphs.

f. Bring the groups close together to share their findings. Ask each group to share one idea and continue around until all ideas have been brought forth. (The teacher may want to tape this session so that the combined analysis of all groups could be heard or seen at a later date).

g. Analysis of this data should bring forth these ideas:

1. Air temperature fluctuates much more than water temperature.

2. Air temperature fluctuates to greater extremes, both high and low.

3. Air temperature is dependent upon weather systems which can change very quickly.

4. Water temperature remains more stable because it takes time to change the temperature of such a large mass.

5. Idea Stimulators (discussion questions):

a. Which graph has the highest temperature. Why?

b. When is the warmest temperature AM or PM? Always?

c. If the PM air temperature goes up, does the PM water temperature go up?

d. Which graph has the lowest temperature? Why?

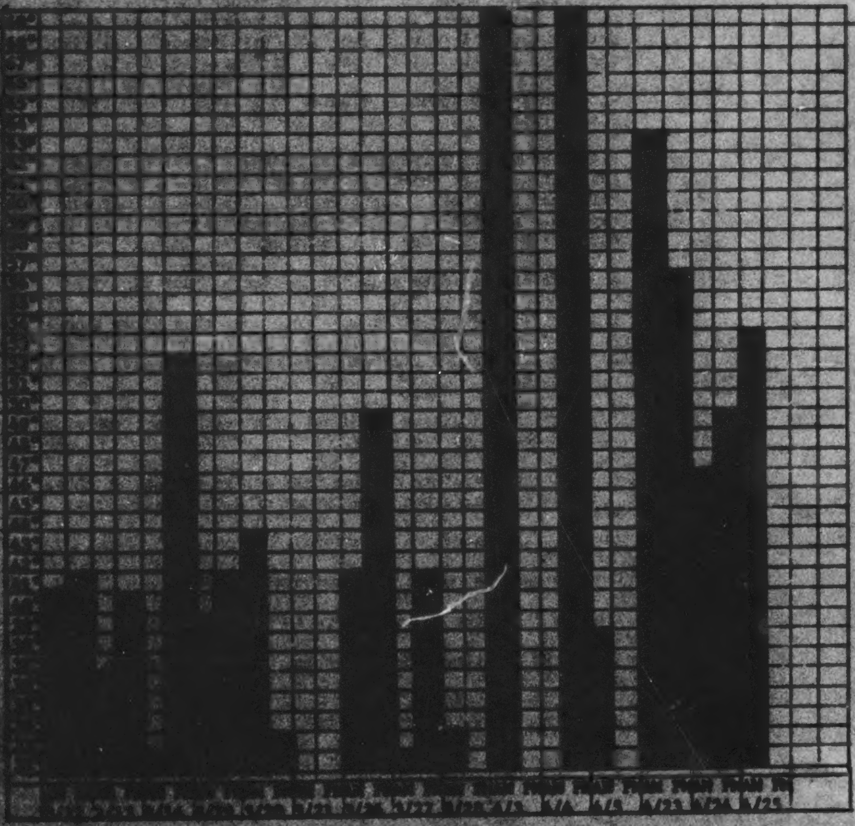
e. Which graph shows the greatest difference in temperature from AM to PM in the same day? Why?

6. References

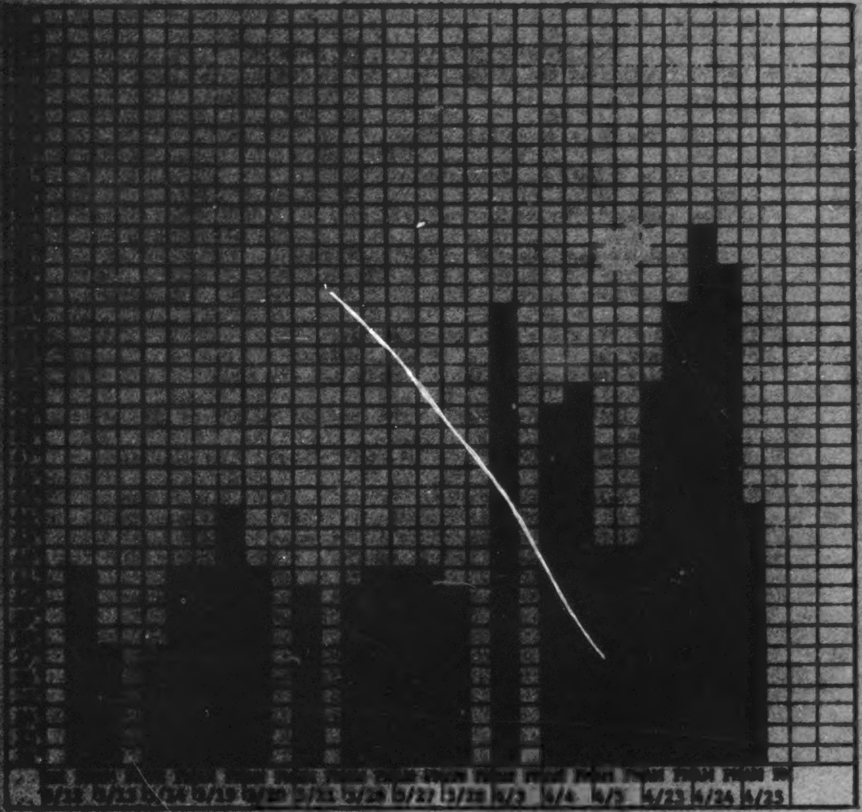
Data provided by the fifth grade students of the extended classroom experiences at Camp Miakonda, Sylvania, Ohio.

Air Temperature

[illegible] [illegible] [illegible] [illegible], Sylvania, Ohio



Water Temperatures
[illegible], Ohio



Upper Elementary

Tim Kreps
Donn Bellinger
Tim Kardatzke

PRECIPITATION/TURBIDITY RELATIONSHIPS
(Does rain effect the distance you can see down into a lake?)

1. Skill area to be developed:

   a. The ability to analyze data.

2. Time involved: approximately 30 minutes.

3. Materials needed: Data sheet for each student.

4. Recommended procedure:

   a. Form the class into groups of five.
   b. Pass out a data sheet to each student.
   c. Give the following directions for the exercise:

      1. Each group member has the same information on his data sheet.

      2. Ask the question: "Does anyone know what turbidity means?"

      3. Allow responses to the question. (Turbidity is basically how far one can see down into the water. It is measured by lowering a white, eight inch disk (called a secchi disk) into the water until it just disappears. A one inch turbidity reading means the water is very muddy or turbid. A greating reading i.e. 15" shows the water to be less turbid, although it is still brownish or muddy in appearance.)

      4. The first column of numbers on your data sheet represent the days from March 1, 1974 through May 20, 1974.

      5. Next to those dates are numbers which represent the amount of precipitation for that day. The letter T represents precipitation greater than zero, yet less than .01 and stands for TRACE of precipitation.

      6. In the third column are the turbidity readings (given in inches) for certain days.

      7. What can your group learn about the relationship of turbidity to precipitation? Someone in your group should take brief notes so you will be able to share your ideas with the class when we reconvene.

      8. Based on what your group can learn about the relationship between turbidity and precipitation, can you make some educated guesses as to what the turbidity reading could have been for some of the dates which do not have a turbidity reading?

d. Give the groups a few minutes to begin to come out with some ideas. During that time the teacher (and aides) will circulate among the groups. If, after giving a group 3 to 5 minutes, they have not begun to generate any ideas whatsoever, then suggest one or more (if necessary) "discussion questions" found below. Hopefully, one or two questions will ignite the group and they will continue with ideas on their own.

e. Give the groups about 15 minutes to generate ideas from their data.

f. Bring the groups together for a sharing of their findings. Ask each group to share one idea and continue around until all ideas have been brought forth. (The teacher may want to tape this session so that the combined analysis of all groups could be heard or seen at a later date.)

5. Discussion questions:

a. What have you learned?
b. What does turbidity mean?
c. What does a secchi disk measure?
d. How would a lake in or around your community become turbid?

hints: 1. It's a man made lake?
2. Ground water seepage runs into it?
3. Other streams flow into it?
4. A large stream also helps to fill it?
5. It's not a deep lake?

e. Was it possible to make educated guesses for the turbidity reading on those days it was not given? Why?
f. When was the lake most turbid? Why? What was the turbidity reading? What was the precipitation reading?
g. When was the lake the clearest or least turbid? Why?
h. Is there anything wrong with a lake which is very turbid?
i. What kind of fish do you think could live in this kind of environment?
j. Could Lake Erie be compared to this lake? How? (Shallow lake, many turbid streams and rivers flow into it. Use a map to illustrate.)

ANALYSIS OF THE DATA SHOULD BRING FORTH THESE IDEAS:

1. Given more than average rain fall for a week (especially 3/3 to 3/9, note 3/4) the following week with zero rain fall will show the water becoming less turbid.

2. After light showers 3/16 to 3/19 the turbidity increases (3.19:14" to 3/20:12") but because of this being a very light amount of precipitation the silt and other particals begin settling out much faster as shown by 3/20:12" to 3/21:13".

3. The clearest water was seen for three consecutive days 3/26 to 3/28 of 17" turbidity. The reason being, very light amounts of rainfall the preceeding week and zero precipitation on 3/26 to 3/28.

4. After one of the heaviest amounts of precipitation shown 4/3, the turbidity reading shows 1" on 4/4. The 15" reading of 4/3 was taken before rainfaill began. Interesting note: 4/3 was date that tornados and floods swept the midwest United Staes killing more than 300 people. Locally, Zenia, Ohio was almost totally leveled.

5. Even after such a storm on 4/3 the water shows signs of beginning to clear on 4/5 i.e., from 4/4:1" to 4/5:3".

ON-GOING ACTIVITY:

Have the class make some sechhi disks (9" pie tins or gallon paint can lids work well) and measure the turbidity of streams, rivers or lakes in the surrounding area. The students could record data and compare it to previous turbidity information.

6. References:

   a. Turbidity readings provided by the fifth grade students of the Extended Classroom Experiences Program at Camp Miakonda, Sylvania, Ohio.

   b. Precipitation readings provided by the Toledo, Ohio Weather Service.

Precipation/Turbidity Relationship
Data Sheet

Date	Amount of Precipitation	Turbidity	Date	Amount of Precipitation	Turbidity	Date	Amount of Precipitation	Turbidity
MARCH 1974			APRIL 1974			MAY 1974		
1)	T		1)	.18		1)	0	9"
2)	.05		2)			2)	0	10"
3)	T		3)	.90	15"	3)	.01	10"
4)	1.31		4)	.03	1"	4)	0	10"
5)	.01		5)	.03	3"	5)	.08	9"
6)	0		6)	0		6)	.03	8"
7)	.29		7)	.30		7)	0	10"
8)	.34		8)	.02		8)	1.00	14"
9)	.21		9)	0		9)	T	6"
10)	0		10)	0		10)	0	10"
11)	0		11)	.02		11)	.58	11"
12)	0		12)	.16		12)	.09	6'
13)	0	8'	13)	0		13)	T	4"
14)	0	11"	14)	.03		14)	.35	8"
15)	0	14"	15)	T		15)	.46	8"
16)	.23	14"	16)	0		16)	.05	6"
17)	.01		17)	0		17)	.41	8"
18)	0		18)	.18		18)	0	
19)	.09	14"	19)	T		19)	T	
20)	T	12"	20)	T		20)	0	
21)	T	13"	21)	0				
22)	.14		22)	T				
23)	0		23)	.17	8"			
24)	.08		24)	T	8"			
25)	.02		25)	0	8"			
26)	0	17"	26)	0				
27)	0	17"	27)	0				
28)	0	17"	28)	0				
29)	.03		29)	.23				
30)	.05		30)	T	10"			
31)	.07							

Upper Elementary

Ervin Doman

Law Breaking

1. Skill areas to be developed:
    - a. The ability to comprehend data presented.
    - b. The ability to analyze the data.
    - c. The ability to help solve problem.
    - d. The ability to generate alternate solutions.
2. Time involved: 30 minutes.
3. Material needed: The three cases on law breaking, plus questions for brainstorming on alternate solutions.

a. Case #1

Mr. A. doesn't drive a car and he never goes anywhere. He refuses to pay taxes because he doesn't want his money to be spent on highways for speeding cars.

b. Case #2

Mrs. B. often drives over the speed limit. She says it's safe. After all Mrs. B. says, she's never been caught by the police, so she really isn't speeding.

c. Case #3

Mr. C. says that police are unfair to all people whose names begin with C. He refuses to listen to policeman and throws rocks at them when they patrol his neighborhood for burglars.

d. Following are questions for brainstorming on the cases above:

Do you think any of these responses are correct? Why?

Does it make any differences what they do? To whom?

Is violence right for some people and not for others? Who is to say?

Can you demand rights without being violent? How?

What other alternatives do each of these people have?

4. Recommended procedure:

   a. Form class in groups of four.

   b. Pass out information with three cases on law breaking. Also the questions to generate alternate solutions.

5. Discussion questions:

   a. Did leadership unfold during the activity.

   b. How effective did group function.

   c. Did opportunity arise for all participants to contribute alternate solutions to each case.

   d. How might the group have functioned more effectively.

Upper Elementary

Leslie Green
Bill Wirick
Charlie Mae Rose

Personal Use of Energy

1. Skill areas to be developed:
    a. The ability to write a questionnaire.
    b. The ability to evaluate data.
    c. The ability to devise a plan of action.

2. Time involved: six class periods.

3. Materials needed:
    a. Dittos and paper.
    b. Film or filmstrip on usage of energy.

4. Recommended procedure:
    a. Show film/filmstrip and follow with class discussion on the kinds of energy that individuals utilize and for what purposes.

    b. Students will prepare a survey on the usage of energy to be passed out in pre-arranged classes. Questions should include source of energy used each day (such as TV, car, radio, toothbrush, stove, furnace), whether the energy is a necessity, and the time or amount of each source of energy is used.

    c. Students will distribute the surveys to the appointed classrooms to be completed by the students.

    d. Collect and evaluate the data surveys. The information can be presented on a chart or in graph form.

    e. Students may want to propose ideas for conserving energy. These ideas could be put in letter form, dittoed, and given to students who participated in survey.

5. Discussion questions:
    a. How do students use different energy sources?
    b. How can we conserve our energy?

Upper Elementary **Talbert B. Spence**

Alternative Brainstorming

1. Skill areas to be developed:

    a. The ability to generate alternatives.
    b. The ability to listen with comprehension.
    c. The ability to evaluate suggested alternatives for clarity and relevence with relationship to topic-area being discussed.
    d. The ability to draw conclusions.

2. Time involved: 30 minutes.

3. Materials needed:

    a. Topic areas for discussion:

        1. Urban housing.
        2. Community Recreation facilities and programs.
        3. Solid waste management (school, community, home).
        4. Urban mass transportation.
        5. Community water quality.

    b. Chart paper and markers.

4. Recommended procedure:

    a. Form the class into groups of 4 or 5's.
    b. Provide each group with list of problem topics in which to generate alternative solutions to the problem.
    c. Each group is provided chart paper and markers to record the alternatives generated.
    d. Provide each group with 20 minutes to develop alternatives. One member of the group records the alternatives.
    e. The recorders of each group share with the other groups their list of alternatives.
    f. During the sharing out activity additional alternatives can be added to each group's list.

5. Discussion questions:

    a. How did leadership unfold during the activity?
    b. How were decisions made?
    c. How effectively did the group function?
    d. How realistic were the alternatives generated by your group to the topic area of discussion?
    e. How might the group have functioned more effectively?
    f. Were there any new strategies gained by sharing out your group's alternatives with the rest of the class?

Upper Elementary and
Junior High

Ervin Doman

Area of a Cube

1. Skill areas to be developed:
    a. Ability to recognize solutions.
    b. Ability to find alternate solutions.
    c. Ability to work with group.
2. Time involved: depends on grade level.
3. Materials needed: Solution cards, cube, centimeter ruler, ruler.
    a. Solution Card #1

    Find the area of a cube.

    You may not use a ruler.

    You may not find the area by measuring all six sides of the cube.

    Try to find two alternate solutions in finding the area of a cube.

    b. Solution Card #2

    Find the area of a cube.

    You may not use a centimeter ruler.

    You may not find the area of a cube my measuring one side and multiplying by six.

    Try to find two alternate solutions in finding the area of a cube.

    c. Solution Card #3

    Find the area of a cube.

    You may not use the estimate procedure.

    You may not take the cube apart and measure to find the area of a cube.

    Try to find two alternate solutions in finding area of a cube.

d. Solution Card #4

Find the area of a cube.

You may not use your index finger or any other artificial instrument as a unit of measure even if you know its measurement.

You may not find the area by measuring three sides and multiplying by two.

Try to find at least two other alternate solutions in finding the area of a cube.

4. Recommended procedure:

   a. Form groups of 4 students.
   b. Provide group with a cube ruler and centimeter ruler.
   c. Pass out cards to each member in the group.
   d. Give the following directions for the exercise:

      1. Cannot solve problem with method or unit of measure on card. Must find alternate solution.

      2. Each group try to have two alternate solutions to the problem.

5. Discussion questions:

   a. Did all or part of groups use instruments to solve problem?
   b. How was decision to the solutions derived?
   c. Was a certain student dominate because he was good in math?
   d. Were all in the group able to contribute a solution or help in a solution as a group?

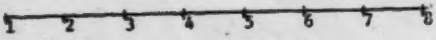
Junior High

James E. Smith

Awareness

1. Skill areas to be developed:
    a. The ability to recognize a problem.
2. Time involved: 30 min.
3. Material needed: paper and pen
4. Recommended procedure:
    a. Each student should draw a line across his paper.
    b. Make 8 marks, 1/2" apart across the line.

    Example:

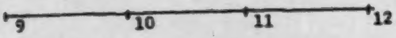


    c. By each mark write in a pollution problem you contributed to in each grade.

    Example: 1st grade - waste paper.

    d. Do this for grades 1 through 8.
    d. On the other side of your paper, mark four lines across one horizontal line 1" apart. This represents grades 9 through 12.

    Example:



    e. Now write in four pollution problems, one for each year. (One that may be most common for that class).

    Example: 11th grade - driving a car.

    f. Below the line write four ways this pollution problem could be prevented or lessened around the school.
5. Discussion questions:
    a. What are some of the problems we contribute to?
    b. What can we do to help lessen them?
    c. Who is the real problem?
    d. What are some of the problem in High School?

Junior High

Gary R. Samples

Water, Water, Everywhere. . . .

1. Skill area to be developed:

   a. Ability to recognize a problem.

2. Time involved: 30 minutes (15 minutes per phase).

3. Materials needed: Six information cards.

   a. Card #1-This opening statement to be read to all members of the Group.

      Chlorine, aluminum sulfate, lime, and soda ash are needed to purify drinking water in Toledo.

      The date is February 10th.

      - Federal money is available for water plant enlargements.

      - Natural purifyers are sunlight, time, sedimentation, and natural filtration.

      Some of the information provided may not be needed.

   b. Card #2

      - Many cities are competing for the limited supply of chlorine and soda ash.

      - Water use is heaviest on Monday; lowest on Sunday.

      - Water useage increases 4% each year.

      - 2 1/2 tons of soda ash are needed to purify 80,000,000 gallons of water.

      - The suburbs and city are expanding at the rate of 1,300 new homes each year.

      Some of the information provided may not be needed.

   c. Card #3

      Plenty of filtering sand is stockpiled.

      Toledo supplies water to the suburbs.

      Sewage plant workers have threatened to strike if the volume of sewage increases this year.

Soda ash presently costs $23/ton and is increasing.

The supply of soda ash is expected to be adequate by mid-1975.

Some of the information provided may not be needed.

d. Card #4

Rainfall averages 10 inches in May, 8 in June, and 6 in July and August.

Chlorine is obtained by an electrical process requiring much power.

Big water users - schools - are not open during the summer for the most part.

Heavily polluted water may require chlorination before and after filtration.

Some of the information provided may not be needed.

e. Card #5

500 lbs. chlorine is needed to purify 40 million gallons of water.

Sewage-nourished algae blooms may block Toledo's water intake pipes in the lake.

80,000,000 gallons of water are produced on an average day during the spring and fall months.

Soda ash can only be supplied at 50 tons per month.

Some of the information provided may not be needed.

f. Card #6

105,000,000 gallons of water are used on an average day during the summer months.

The city has ample rock salt to soften water on hand.

Toledo can store 43,000,000 gallons in various tanks.

Few wells exist in the city anymore.

29,290,000,000 gallons were processed by the water treatment plant last year.

Some of the information provided may not be needed.

4. Recommended procedure.

    a. Form the class into groups of six.

    b. Pass out the cards to each group. (one card to each member of the group)

    c. Give the following directions for the exercises:

        1. Participants may not show their card to anyone.

        2. Participants may read the information on the card to anyone in their group.

        3. Some of the information on the cards may be irrelevant.

5. Discussion questions:

    a. Based on the information provided, what do you see as one of the major environmental problems Toledo faces?

    b. What can be done to remedy it?

Junior High

Dave Sandys
Dick Sandys
Jim Obenour
Ron Gardner

Beep, Tweet and Zoom

1. Skill areas to be developed:
   - a. The ability to listen.
   - b. The ability to collect data.
   - c. The ability to organize data.
2. Time involved: 75 minutes.
3. Material needed: Battery tape recorders.
4. Recommended procedure:
   - a. Form class into groups, size depends on the number of tape recorders.
   - b. Discuss organization of project.
     1. Each group will take a recorder to a different corner or area of their environment (corner of main street, corner of school block, corner of park).
     2. Each person will write down all sounds he hears while tape is recording for a ten minute period.
     3. After all groups have returned make a list of all sounds they heard either by groups of noises (car noises, bird noises) or by number of individual noises (36 car engines, 4 car horns, 3 car mufflers).
     4. Have the class listen to sections of tapes to check students' ability to listen or have each group listen to their entire tape to check their ability to listen.
     5. Organize data into a graph to show relationship of noises.
5. Discussion questions:
   - a. How well did the students listen?
   - b. Did the tape recorder pick up sounds the students missed? Why?
   - c. Is this a good survey of noises in our outdoor environment?
   - d. Would the results have been different at other times or places?
   - e. How do these noises affect our lives?

Junior High **John T. Murnen**

Pictures Tell The Story

1. Skills to be developed:
    - a. The ability to recognize a problem.
    - b. The ability to define a problem.
    - c. The ability to generate alternative solutions.

2. Time involved: 45 minutes.

3. Materials needed:
    - a. Pictures, which show a problem, cut from magazines. These may be secured by the students or supplied by the teacher.
    - b. An opaque projector to project the pictures on a screen (optional) or the pictures may be passed among the students.
    - c. Pencil and paper.

4. Recommended procedure:
    - a. Project the pictures on a screen or pass then around the room.
    - b. Ask the students to number their paper to correspond to the numbers on the pictures.
    - c. While viewing the pictures, have the students answer the following questions:
        1. What problem does the picture suggest to you?
        2. What are several solutions to this problem?
    - d. Give the students three minutes on each picture.
    - e. When the list has been completed, view each picture again, and discuss and compare the alternatives.

5. Discussion questions;
    - a. Could there be any other problems suggested by these pictures?
    - b. What do you suppose caused these problems?
    - c. Would other problems be created by the solutions that were suggested?
    - d. Would people be willing to sacrifice some comforts to solve these problems?

Upper Elementary and
Junior High

Ervin Doman

Area of a Cube

1. Skill areas to be developed:
    a. Ability to recognize solutions.
    b. Ability to find alternate solutions.
    c. Ability to work with group.
2. Time involved: depends on grade level.
3. Materials needed: Solution cards, cube, centimeter ruler, ruler.
    a. Solution Card #1

    Find the area of a cube.

    You may not use a ruler.

    You may not find the area by measuring all six sides of the cube.

    Try to find two alternate solutions in finding the area of a cube.

    b. Solution Card #2

    Find the area of a cube.

    You may not use a centimeter ruler.

    You may not find the area of a cube my measuring one side and multiplying by six.

    Try to find two alternate solutions in finding the area of a cube.

    c. Solution Card #3

    Find the area of a cube.

    You may not use the estimate procedure.

    You may not take the cube apart and measure to find the area of a cube.

    Try to find two alternate solutions in finding area of a cube.

d. Solution Card #4

Find the area of a cube.

You may not use your index finger or any other artificial instrument as a unit of measure even if you know its measurement.

You may not find the area by measuring three sides and multiplying by two.

Try to find at least two other alternate solutions in finding the area of a cube.

4. Recommended procedure:

a. Form groups of 4 students.
b. Provide group with a cube ruler and centimeter ruler.
c. Pass out cards to each member in the group.
d. Give the following directions for the exercise:

   1. Cannot solve problem with method or unit of measure on card. Must find alternate solution.

   2. Each group try to have two alternate solutions to the problem.

5. Discussion questions:

a. Did all or part of groups use instruments to solve problem?
b. How was decision to the solutions derived?
c. Was a certain student dominate because he was good in math?
d. Were all in the group able to contribute a solution or help in a solution as a group?

Junior High

William B. Stapp
Talbert B. Spence

Building Power (Coalitions)

1. Skill areas to be developed:
    a. The ability to define an issue.
    b. The ability to recognize the central issue of a problem.
    c. The ability to develop a power base.
    d. The ability to communicate clearly.

2. Time involved: 40 minutes.

3. Materials needed: none.

4. Recommended procedure:
    a. Have students count off by two's.

    b. Have all the students who are number "ones" move to the front of the room and give five minutes to decide on a group position or approach to the issue of Urban Mass Transportation within the present energy crisis.

    c. All number "two's" are assigned to represent an organization concerned with the energy crisis (e.g. movement for economic justice; environmental policy center; Model Cities Neighborhood Association; United Urban Transportation Association; Community Transportation Union, etc.

    d. A sign is placed on the chest of each number two noting the organization he represents.

    e. The "one's" are then given 10 minutes to obtain a commitment from one or more number "two's" to join their side. Two's need not commit themselves to any group.

    f. The new teams take 5 minutes to firm up or clarify their position more strongly ("two's" can break off from coalitions and form a group of uncommitted "two's").

    g. The coalition groups ("one's" and "two's" try to convince the uncommitted "two's" to join their coalition for 10 minutes.

5. Discussion questions:
    a. How did leadership unfold during the activity?

b. How was the membership of coalitions formed?
c. How was power formed by coalitions?
d. How did your group decide on your persuasion arguments?
e. How were decisions made?
f. Was there real or ritualistic listening during persuasion arguments?

Junior High

David H. Sandys
Richard B. Sandys
Ron Garner
James D. Obenour

An Electrical Survey

1. Skill area to be developed:
    - a. The ability to collect data.
2. Time involved: variable (as a homework assignment)
3. Materials needed:
    - a. A survey form:

<table>
<tr><td colspan="3">Identify all the things in your home that use electricity and put them in the appropriate categories below.</td></tr>
<tr><td>1. We couldn't do without</td><td>2. Could do without with some difficulty</td><td>3. Are really not necessary</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

4. Recommended procedure:
    - a. Give each student a survey form.
    - b. Ask them to take home the form and place each electrical appliance they find around their house in the column they feel is appropriate.
    - c. Bring the form back the next day.
5. Discussion Questions:
    - a. How many electrical uses did you list in column 1? What did people do before electricity was used to power these appliances?
    - b. How much electricity does your home use in a day, month, year? How can you find out?
    - c. Make a list of as many PRACTICAL ways you can think of to cut down on electrical consumption in your home. Try them to see if they work.

Junior High

Leslie Green
Charliemae Rose
Bill Wirick

Solid Waste Reduction and Removal

1. Skills to be developed:

    a. The ability to collect data.

2. Time involved: one week (5 class periods)

3. Materials needed:

    a. Map of school and grounds.
    b. Filmstrip cassette or movie on solid wastes.

4. Recommended procedure:

    a. The first class period should be used as an introductory session. A movie or filmstrip could be shown to initiate ideas and give the students some background information. Follow this with a discussion of the kinds of solid waste and and their sources around the school.

    b. Have students divide into groups. Each group should select one type of waste and determine its sources at the school.

    c. The collected data should be discussed and compiled within the the groups. (Some data ideas are: location of trash collection, amounts of trash and times of pick-ups, sources of trash, methods of disposal, use of disposable materials, recycling).

    d. Each group should submit to the class a written summary of its data and one or two practical means of lessening the amount of waste. They may also have ideas about getting some of the wastes to recycling centers.

    The groups can send their proposals to the appropriate person in the school.

5. Discussion questions:

    a. Are there comparable waste problems in your homes or neighborhoods?

    b. How can you convince people to use returnable bottles rather than cans and throw-away bottles?

Junior High

Richard Sandys
David Sandys
Ron Garner
Jim Obenour

This Is Me

1. Skill area to be developed:
   - a. The ability to collect data.
   - b. The ability to organize data.
2. Time involved: two class periods
3. Materials needed.
   - a. Pictures from magazines, newspapers, and other sources.
   - b. Glue
   - c. Sheet of thin cardboard or heavy construction paper.
   - d. Scissors
4. Recommended procedure:
   - a. Cut from magazines and other sources pictures which represent how you see yourself. These pictures might include what you like or dislike in the way of food, sports, etc. Where you live, what you want to be, what you are, where you have traveled.
   - b. Make a collage out of these pictures. When gluing these pictures be sure to overlap them and cover the entire surface.
5. Discussion question:
   - a. What do these pictures tell about you?
6. Variations on the same project:
   - a. Do a collage entitled: A Famous Person, or the U.S.A., or Pollution or The City.

Junior High

Blanche Edelman
Doris Jones
Demitra Balmer

The Numbers Game

1. Skill area to be developed:

   a. The ability to organize data.

2. Time involved: 30 minutes

3. Material needed:

   a. Envelope with 4 sheets of numbers - all alike.

   Sheet (1) - Pick out all the number sets which contain any zero's and list them. Arrange in order, smallest to largest.

12456
39809
5432
47001
430
46
3178
14603
4692
50000
220
809
7486
27806
4110
6892
42701
26
892
1010
46055
10
767
2302
45507
403
1401
34
500

991
41762
80
2
520
2210
909
406
111
883
2071
103
706
2006
150
525
710
1140
33012
13021
5001
6708
38426
9874
27954
5740
805
207
23035

13572
5862
6700
306
880
600
456
333
12340
21033
37071
16060
15000
672
542
609
550

b. Sheet (2) - The same 76 number sets are on this sheet, but directions are: List all even numbers. Arrange in ascending order.

c. Sheet (3) - Same numbers as above.

Directions: List all numbers which have double or multiple of same digits. These may be zeros (Ex. 40706,333) or any other number. Arrange these in ascending order.

d. Sheet (4) - Same number sets.

Directions: Organize the entire set of numbers on the sheet according to size, list from smallest to largest.

4. Recommended procedure:

a. Form the class into groups of four.

b. Give each group an envelope containing the 4 sheets with directions.

c. Give the following directions:

1. Each member of the group will take one sheet and follow the directions on that sheet. If any member of the group finishes before others, he can help any other member complete the task.

When the group has finished the individual assignment, the one who has the complete list arranged in ascending order will read the numbers. Each of the other members of the group will check off and O.K. orally, that number from his list as the number is read. If two or more people claim the number, such as 400 would be claimed by all three; the reader of the master sheet will place a "3" before that number. If two people claim it, a "2" will be placed in front of the number. If only one claims it, then a "1" will be placed before the number. When the numbers 1, 2, and 3 are totaled, list can be checked for accuracy, there should be 36 "1's", 25 "2's" and 15 "3's".

5. Discussion questions:

a. Did you work well together as a team?

b. Did you discover any method to help you arrange your numbers according to size? If so, could you share it with the class?

c. Did you feel any pressure to complete your part of the task before the others completed theirs?

d. If you needed help in completing your part did you mind getting help from another member?

Junior High

Blanche Edelman
Doris Jones
Demitra Balmer

CEDAB

1. **Skill area to be developed:**

   a. The ability to organize data.

2. **Time involved:** 30 minutes

3. **Material needed:**

   9 x 12 manila envelope containing 5 small envelopes, each is marked with a letter of the alphabet - A; B; C; D; E;

   a. The envelope with letter "A" contains 9 cards, marked AC; AE; AD; ABC; ACE; ABE; ADEB; AECD; ABCE;

   b. Letter "B" envelope has the following cards:- BD; BC; BE; BCE; BDE; BAC; BCDE; BACE; BADE;

   c. Letter "C" envelope has the following cards:- CE; CD; CA; CEA; CBD; CAB; CDEB; CABE; CADE;.

   d. Letter "D" envelope has the following cards;- DC; DE; DB; DEA; DBC; DAB; DBCE; DCBA; DBCA;

   e. Letter "E" envelope has the following cards;- EA; EC; ED; EAB; EBD; ECA; EABC; ECDA; EBCD;.

4. **Recommended procedure:**

   a. Form the class into groups of five.
   b. Give each group a large envelope containing the five smaller envelopes.
   c. Give the following directions for the exercise:-

      1. Each member of the group is to take one small envelope and be responsible for the listing of the letter found on the outside of his envelope.

      2. After all the cards in the envelope have been recorded, sort cards through by second letter. (Ex. AC, ACE, ACDB)

      3. Exchange cards using 2nd letter thus giving appropriate cards to member assigned to that letter.

4. Each member will then tally the new cards. Do not record a card if the letters it contains have already been recorded in another sequence.

5. Sort cards according to third letter. These cards are passed to tallier of that letter. All two letter cards are retained.

6. After recording sort for fourth letter. Pass to appropriate tallier. Retain cards with three letters.

7. All cards having been passed and recorded, each member now tallies the number of recordings he or she has made.

8. All those with letter

A	should	have	15
B	"	"	13
C	"	"	14
D	"	"	14
E	"	"	14

5. Discussion Questions:

   a. Did you have any difficulty in your group in sorting and passing cards?

   b. Did your group work well together?

   c. Can you think of any easier method of sorting or tallying this information?

   d. Did someone in your group assume the responsibility for keeping things going? If so, how did this come about?

   e. How could you check to make sure you had not missed any cards which you should have reported?

A's Tally

A
AC
AD
AE
ABC ABD AED
ABE
ACE
ABCE ACDE
ADEB ABDE
AECD DCBA

15

B's Tally

B
BC
BD
BE
BAC BDE
BCD DAB
BAE
BACE
BADE DCBA
BCDE

13

C's Tally

C
CA BC
CD
CE
CAB
CBD DBC
CEA
CABE ABCD
CDEB

14

D's Tally

D
DB DA
DC
DE
DAB BDE
DBC
DEA
DBCE CDEB
DCBA ADEB
DECA

14

E's Tally

E
EA
EC BE
ED
EAB
EBD DEA
ECA
EABC
EBCD AECD
ADEB
ECDA

14

Junior High

Tim Kardatzke
Don Hellinger
Tim Kreps

Gasoline Mileage and Speed

1. Skill areas to be developed:

    a. The ability to analyze data.

2. Time Involved: 30 minutes.

3. Materials needed: Each student should be given a paper on which will be the following data table to be completed with the use of a mileage log from the map of Ohio.

Average Speed	Trip	Miles traveled	Gallons	Miles per gallon
70 mph	Toledo to Dayton	(153 miles)	13.9	(11)
50 mph	Dayton to Cincinnati	(55 miles)	3.1	(18.75)
65 mph	Cincinnati to Columbus	(109 miles)	9.1	(12)
60 mph	Columbus to Cleveland	(139 miles)	10.3	(13.5)
55 mph	Cleveland to Toledo	(110 miles)	7.1	(15.5)

4. Recommended procedure:

    a. Form the class into groups of two.

    b. Pass out the worksheets one to each student.

    c. Pass out one Ohio roadmap to each team of two students.

    d. Tell the class that the data on their handout was collected by a traveling salesman as he drove from one city to another in Ohio. To save on his gasoline bills he wants to figure out at what speed he can run his car while using the smallest amount of gasoline.

    e. Have the students find the mileage log in the Ohio raodmap and demonstrate how it is used.

    f. Have the students look up the mileage between the cities listed on each trip and write their findings in the proper space on the data chart under "Miles Traveled).

    g. Observe the different groups and give individual guidance where needed.

    H. Have one student demonstrate at the blackboard how the miles per gallon can be computed by dividing the "Miles Traveled" by the number of gallons used.

   i. Have the students record the "miles per gallon" figure for each "trip" on their data table.

   j. Ask any group to copy their data table on the blackboard.

5. Discussion questions:

   a. Did the salesman drive at the same speed on each of his trips?
   b. On which trip did he travel the slowest?
   c. On which trip did he travel the fastest?
   d. On which trip did he get the most miles per gallon?
   e. On which trip did he get the fewest miles per gallon?
   f. What conclusions can you draw between driving speed and fuel consumption?

6. References: Ohio roadmaps may be obtained from most gasoline stations or from the Ohio Dept. of Transporation.

Junior High

Tim Kardatzke
Tim Kreps
Don Hellinger

Geologic Time Worksheet

1. Skill areas to be developed:

    a. The ability to analyze data.

2. Time required: 30 to 45 minutes.

3. Materials needed:

    a. One copy of the geologic time-scale for each student.
    b. One copy of the worksheet for each student.
    c. One physical map of North America on sisplay.

4. Recommended procedure:

    a. Form the class into groups of two.

    b. Hand out a geologic time scale to each student.

    c. Hand out a worksheet to each student.

    d. Ask the students which part of the time scale represents present time.

    e. Ask the students which part of the time scale represents the most distant past.

    f. Have one student go to the physical map of North America and point out the Appalacian, Rocky, Coast Range and Sierra Mountain ranges to the class.

    g. Direct the students to fill in the answers to each question on their worksheet.

    h. Move about the room and give individual guidance where needed.

5. Discussion Questions:

    a. How much of the geologic time scale would be needed to show the time since the American Revolution?

    b. Do oceans and mountains last longer than some forms of life?

6. References:

Interaction of Earth and Time, Interaction Science Curriculum Project, Rand McNally and Company, Chicago, 1972.

THE GEOLOGIC TIME SCALE

Era	Period	Epoch	Years Ago In Time		Oldest Fossils of Various Types	Percent of N. America Under Water	Mountain Building
			Began	Ended			
CENOZOIC	**Quaternary**	**Recent**	12,000?			0%	
		Pleistocene	1,000,000	12,000?			
	Tertiary	**Pliocene**	11,000,000	1,000,000		5%	Coast Range and Sierras
		Miocene	23,000,000	11,000,000			
		Oligocene	35,000,000	23,000,000			
		Eocene	55,000,000	35,000,000	Horses and camels		
		Paleocene	70,000,000	55,000,000			
MESOZOIC	**Cretaceous**		135,000,000	70,000,000	Flowering plants	50%	
	Jurassic		180,000,000	135,000,000	Birds, dinosaurs and mammals		Rocky Mountains
	Triassic		220,000,000	180,000,000			
PALEOZOIC	**Permian**		270,000,000	220,000,000	Pine Trees		
	Pennsylvanian		320,000,000	270,000,000	Reptiles	20%	Appalachian Mountains
	Mississippian		350,000,000	320,000,000	Insects, Amphibians coelacanths	30%	
	Devonian		400,000,000	350,000,000			
	Silurian		440,000,000	400,000,000	Land plants, fish, many animals without backbones		
	Ordovician		500,000,000	440,000,000			
	Cambrian		600,000,000	500,000,000	Many animals without backbones. Sea plants		
PRECAMBRIAN			[illegible],000,000,000	600,000,000			

Worksheet

Name________________

Date________Class______

THE GEOLOGIC TIME SCALE

Directions: Read each question. Use the geologic time scale handout to come up with the answers. Write your answer in the space provided.

1. Which is the longest type of time unit? an Era, a Period, an Epoch (circle 1)

2. The earliest Era was the ______________________Era.
It started about ____________years ago.

3. During which Period did the reptiles show up?____________________

4. During which Period were dinosaurs on the earth?____________________

5. Did insects and amphibians develop before or after the reptiles?______

6. What is the oldest type of life found as fossils?________________

7. The Pleistocene Epoch was the time of the glaciers. When were the glaciers starting to move over parts of the earth?________________

8. Which would be younger; a fossil from the Permian Period or one from the Pennsylvanian Period?_____________________________

9. Which Period would a 200,000,000 year old fossil be from?__________

10. Would we find any reptile fossils in the rocks of Silurian age?______
Why or why not?_____________________________

11. Which came first; pine trees or flowering plants?________________

12. Which mountain range is the oldest?______________________
Which mountain range is the youngest?____________________

13. During which Period was North America covered with the most water?
____

14. Could the first insects have inhabited the Rocky Mountains?________
Why or why not?_____________________________

15. The length of time that life has been on earth is what percent of the earth's age? (the earth began at the start of the Precambrian)

______________per cent

Junior High

William B. Stapp
Talbert Spence

Community Survey

1. Skill areas to be developed:

   a. The ability to define a problem.
   b. The ability to collect data.
   c. The ability to organize data.
   d. The ability to analyze data.
   e. The ability to prepare accurate information on material collected.

2. Time involved: Will vary with the scope of survey.

3. Recommended procedure:

   a. Develop a series of specific questions relevant to your local community that students might seek answers to. You might consider several of the following areas: government, life style, solid waste, water, air, housing, transportation, etc.

   b. Have students group into research teams assigned to do specific subsets of the total survey.

   c. Have research teams obtain data by using the following methods: observation; interviews; reviewing resource materials from public library; using audio-visual equipment (cameras, tape recorders, etc.)

   d. Have research teams evaluate closely all the compiled data and prepare and submit a written report, also to be presented orally by each of the investigative teams.

4. Discussion questions:

   a. What were your initial feelings about your community? (Warm and friendly, cold and impersonal, folksy, etc)? What was responsible for evoking these feelings?

   b. Do you enjoy living in your community? Why or why not?

   c. Does your community have a litter problem?

   d. What is the size (area and population) of your community?

e. Make a diagram to illustrate the basic structure of the political machine of your community government.
   -e.g. (mayor, council, city manager, departmental heads, etc.).

f. Does the community have an urban soil erosion and sedimentation ordinance?

5. Reference (Sample type of Qeestions):

Recreation

1. What are the major recreation facilities (by categories) within the community?

2. What are the major recreation facilities in close proximity to the community which influence the community?

   a. List some of the ways in which this influence is apparent.

   b. How do you go about determining this?

3. In particular, what is the impact of such activities as recreational fishing, camping and winter sports on the community and the surrounding area?

   a. Is the visual access to the park adequate and does the park play a role in improving the aesthetic qualities of the community in which it is located?

   b. Is the physical access for walking and/or driving to the park adequate?

   c. Is the physical design pleasing and are the land contours natural?

   d. Are the park facilities and equipment adequate and creatively designed?

   e. Is the park equipped for year around service?

Junior High Level Bill C. Plummer

Cribbage

1. Skill areas to be developed:

   a. The ability to make alternative decisions.

2. Time involved: Approximately 30 minutes

3. Material needed: Deck of playing cards and cribbage board for each set of 2 players.

Cribbage is played with a regular deck of cards (52) and cribbage board (facsimile on page 2). There is a total of 120 points which can be tallied on a sheet of paper when a board is not available.

Scoring

a. Total of 15 = 2 points. Possible combinations.
5 and face card = 2 points. 7-8 = 2 points. Ace, 2, 2, 10 = 2 points. 9 and 6 = 2 points. (many others) 3,2,10.

b. Sequences or runs = (mixed suits)

3 cards needed for a run. 1, 2, 3, = 3 points.
6, 7, 8 = 3 points. 4, 2, 1, 3 = 4 points.
5, 6, 7, 4 = 4 points.
A sequence of 5 will yield 5 points = order disregarded.

c, Pairs = 2

2 of a kind = 2 points. 2 queens = 2 points. 2 4's = 2 pts.
3 of a kind = 6 points. 3 7's = 6 pts. 3 3's = pts.

d. Flush

1. 4 cards in hand = 4 pts.
2. 4 cards in cribbage plus top card (needed) = 5

e. Value of Cribbage

1. When cards are dealt each player discards 1 card for the crib.

2. Dealer counts crib after game; and hands are counted.

3. Crib consists of one card from each player plus top card on deck.

4. Cut at jack = 2 pts.

5. Dealer receives 2 pts. if he cuts a jack.

6. Hold a jack of suit top card on deck = 1 pt.

4. Recommended procedure: Divide class into groups of 2

Playing

1. Each player discards 1 card; player to right of dealer cuts for top card.

2. Beginning with player left of dealer:

Player A = 7
B = 8 B pegged 2 pts.
C = 6 C rc. 3 for a run
D = face card = a total of 31 = 2 pts.
under 31 pts. = A "go" = 1 pt.

Pegging consists of accumulating points by 15's, pairs, or runs as cards are being played.

(see page 3)

3. Dealer deals 5 cards to each.

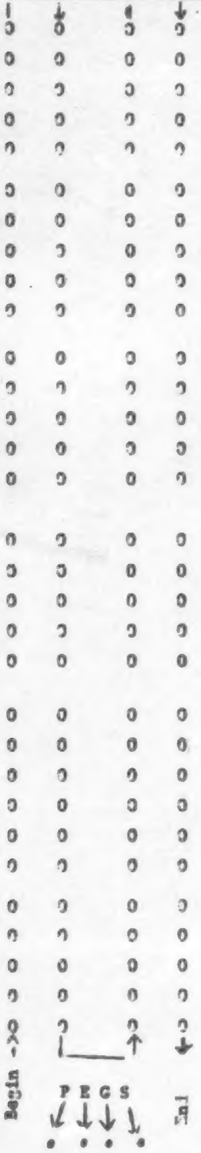
4. Game consists of complete round of cut board.

5. Discussion Questions

a. What possible hands and their value?

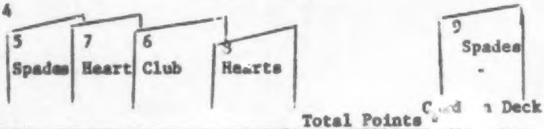
b. Why did I discard to the Crib that card?

c. What cards do I look for and value?


Begin
P E G S
End

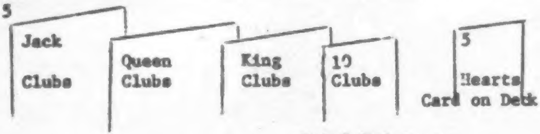
SUGGESTED HANDS

4


5
Spades
7
Heart
6
Club
3
Hearts
9
Spades
Card on Deck

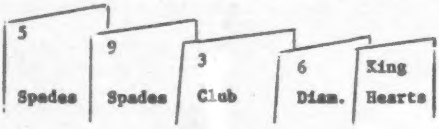
Total Points =

5

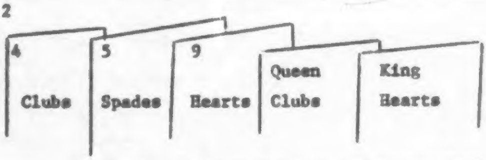

Jack
Clubs
Queen
Clubs
King
Clubs
10
Clubs
5
Hearts
Card on Deck

Total Points =

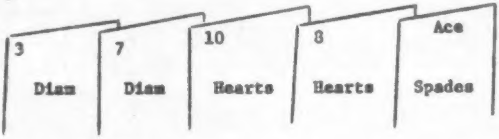
1 Which card would you put in the crib:


5
Spades
9
Spades
3
Club
6
Diam.
King
Hearts

2


4
Clubs
5
Spades
9
Hearts
Queen
Clubs
King
Hearts

3


3
Diam
7
Diam
10
Hearts
8
Hearts
Ace
Spades

Junior High Bill Plummer

Conversion of Units of Measure

1. Skill area to be developed:

    a. The ability to generate alternative solutions.

2. Time involved: 30 - 40 minutes.

3. Material needed.

    a. Five cards with one method on each card. (Card explains how to convert units of measure.) Also on each card have several problems to be solved using this method as follows:

        Card #1 Intuitive (most textbooks ignore this process of conversion). Look at the unit of measure. If the unit of measure is getting larger we divide by the number. If the unit of measure is getting smaller we multiply.

        1. Change 30 inches to feet — getting larger units so divide.

        2. Change 15 fathoms to feet — getting smaller units so multiply.

        3. 5 yards to meters — 1 yard = .9 meter, an exception.

        4. 45 feet second to yards/min. Can't be done.

        Card #2 Idiot (found in Kennely's "Tricks of the Trade") Even an idiot understands this method: Look at the numeral. If the numeral gets larger we multiply, if smaller we divide.

        1. Change 30 inches to feet (12) inches = (1) foot gets smaller so divide.

        2. 15 fathoms to feet (1) fathom = 6 feet gets larger so multiply.

        3. 5 yards to meters, (1) yard = (.9) meter exception so multiply.

4. 45 Feet/second to yards/minute can't be done.

Card #3 Renaming (found in Payne's Harbrace, Math 7th and 8th.
Call 12 inches (12x1) and replace the unit to be changed to its equivalent desired new unit 12x1/12 and multiply.

1. 30x1 inch to feet = 30 x (1/12 ft.)
2. 15x1 fathom to ft. = 15 x (6 ft.)
3. 5x1 yd. to meters = 5 x (.9 meters.)
4. $45\text{x} \frac{1\text{ ft.}}{1\text{ sec.}}$ to yds./minutes = $45 \times \frac{1/3\text{ yd.}}{\frac{1}{60\text{ minute.}}}$

Card #4 Proportional (found in Keedy's "Exploring Modern Math I")

1. 30 inches to feet = $\frac{30\text{ inches}}{x\text{ feet}} = \frac{12\text{ inches}}{1\text{ foot}}$
2. 15 fathoms to feet = $\frac{15\text{ fathom}}{1\text{ foot}} = \frac{1\text{ fathom}}{6\text{ feet}}$
3. 5 yds. to meters = $\frac{5\text{ yd.}}{x\text{ meters}} = \frac{1\text{ yd.}}{.9\text{ meters}}$
4. 45 ft/sec to yds/minute = Can't be done.

Card #5 Cancelling (found in Garrgit's "Exercises of Chemistry.")
Multiply the quantity by a value of one (i.e. $\frac{12\text{ inches}}{1\text{ ft.}}$; $\frac{1\text{ ft.}}{12\text{ inches}}$ with an arrangement which cancels the given unit and produces the desired unit.

1. 30 inches to feet = $\frac{30}{1} \cancel{\text{inches}} \times \frac{1\text{ ft.}}{12\ \cancel{\text{inches}}}$.
2. 15 fathoms to feet = $\frac{15\ \cancel{\text{fathoms}}}{1} \times \frac{6\text{ ft.}}{1\ \cancel{\text{fathom}}}$
3. 5 yds. to meters = $\frac{5\text{ yds.}}{1} \times \frac{.9\text{ meters}}{1\ \cancel{\text{yd.}}}$
4. 45 ft. per second to yds. per minute =

$$\frac{45\ \cancel{\text{ft.}}}{\cancel{\text{sec.}}} \times \frac{1\text{ yd.}}{3\ \cancel{\text{ft.}}} \times \frac{60\ \cancel{\text{sec.}}}{1\text{ min.}}$$

4. Recommended procedure:

   a. Divide the class in five groups.

   b. Explain to the class that each group will receive a card with four problems to be solved. Explain further that when they are finished to notify the teacher.

   c. When all groups have finished rotate cards to different groups.

   d. Continue the above procedure until all five groups have done all five cards.

   e. Pick up the cards and proceed with class discussion and questions. List on the blackboard the advantages and disadvantages of each method.

5. Discussion questions:

   a. What are the advantages and disadvantages of each method?

   b. Which method is the easiest?

   c. Which method is the best?

   Possible discussion on advantages and disadvantages of each method.

   1. Intuitive.

      Advantages:

      a. Quick-obvious to about half of the students.

      Disadvantages:

      a. Half don't readily see it.
      b. There are exceptions
      c. Not structural.
      d. Limited to single conversions.

   2. Idiot.

      Advantages:

      a. No thought of units — just the size of the numerals.

      b. Structured.

      Disadvantages:

      a. Limited to single conversions.

      b. There are exceptions.

3. Renaming

Advantages:

a. Continues simple algebraic approach of texts.
b. No exceptions
c. It is structured.
d. Multiple conversions possible. (with complex fractions).

Disadvantages:

a. Requires Algebraic concept and a simplified inverse relation of intuitive approach.

4. Proportional

Advantages:

a. Continues proportional approach of texts.
b. No exceptions.
c. It is structured.
d. No thought of units size.

Disadvantages:

a. Requires understanding of proportions.
b. Limited to Single Conversions.

5. Cancelling

Advantages:

a. Structured.
b. No exceptions.
c. No thought of unit size.
d. Can be used in multiple conversion (Also allows faster cancellation of numerals.)

Disadvantages:

a. Difficult for average Junior High students.

6. References.

Keedy, M.L., Exploring Modern Mathematics Book I, 1964.

Stein, Edwin J., Refresher Mathematics, Revised Edition, Grades 7, 8; 1970.

Payne, Joseph N., Harbrace Mathematics, Introduction to Secondary Mathematics, 1972.

Junior High

William B. Stapp
Talbert R. Spence

Occupational Prestige Ranking

1. Skill areas to be developed:

   a. The ability to select alternative solutions to a problem.
   b. The ability to solve a problem.
   c. The ability to think critically.

2. Time involved: 45 minutes.

3. Materials needed:

   a. Occupational Prestige Ranking sheets (sample).
   b. Teacher answer key and Letter Code

4. Recommended procedure:

   a. Group students in teams of five or six.

   b. Provide each team member with a ranking sheet; instruct students that this activity is designed to see how close they come to the correct ranking for the occupations listed.

   c. Have each team member read the directions at the top of the ranking sheets; instruct them that their first task is to rank each of the 15 occupations in order of the most prestigious. Allow 10 minutes for completion of this segment.

   d. Instruct each team to discuss among themselves their individual rankings; have each team after about 10 minutes come with a group ranking reflecting how the team as a whole views each occupation's prestige.

   e. Have students in each team share out why he or she agreed to the group ranking or why they didn't agree. (allow 10 minutes)

   f. Teacher provides the correct answer of occupational rankings on blackboard for individuals and teams to do a comparison of their selections to the correct prestige rankings.

   g. Have students total up their individual scores by using the (I-K, see key) to calculate their mistakes on ranking sheet.

   h. Have students total up team scores by using (G-K; see key) to compare how the group did overall in the ranking. (Allow 15 minutes for #f, g, h and Discussion questions).

5. Discussion questions:

   a. How was leadership in the teams formed?

   b. How effectively did the team function?

   c. Was your team able to complete the assigned task? Why?

   d. How were decisions made?

   e. Did any new strategies or ways of doing the ranking activity spring up because your group worked together?

   f. How did you feel as an individual making such a judgement?

   g. Did you feel left out of the team?

   h. How might your team have functioned more effectively?

OCCUPATIONAL PRESTIGE RANKING SHEET

Answer Key

Instructions: rank the following occupations according to the prestige which is attached to them in the United States. Place a "1" in front of the occupation which you feel to be most prestigious, etc., all the way to "15", least prestigious.

I	G	K		I-K	G-K
		(12)	Author of Novels		
		(14)	Newspaper columnist		
		(15)	Policeman		
		(9)	Banker		
		(1)	U.S. Supreme Court Justice		
		(6)	Lawyer		
		(13)	Undertaker		
		(3)	State Governor		
		(10)	Sociologist		
		(11)	Public School Teacher		
		(7)	Dentist		
		(8)	Psychologist		
		(5)	College Professor		
		(2)	Physician		
		(4)	Scientist		
			TOTAL		

Letter Code

A.) I = Individual Ranking
B.) G = Group Ranking
C.) K = Known (Correct) answer
D.) I-K = Individual - minus - Known (Correct Answer)
E.) G-K = Group - minus - Known (Correct Answer)

Junior High William B. Stapp

Six Bits
(Toledo Rapid Transit Bus System)

1. Skill areas to be developed:

    a. The ability to listen with comprehension.
    b. The ability to recognize useful data.
    c. The ability to collect data.
    d. The ability to organize data.
    e. The ability to analyze data.
    f. The ability to draw conclusions.

2. Time involved: 30 minutes.

3. Material needed: Six bit cards.

    a. Card #1

    YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

    Your group has all the information needed to answer the following question:

    > Toledo is considering the establishment of a Rapid Transit Bus System between the suburbs and the city of Toledo. Would the estimated revenue generated by the system be offset by the estimated costs incurred in operating the system?

    Some of the information provided may be irrelevant.

    b. Card #2

    YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

    TARTA needs 5 buses operating on each line.

    A federal grant will provide the initial cost of 25 buses.

    All buses will run for 10 hours per day, Monday through Friday.

    Busses will use the center lane of the expressway for express services.

c. Card #3

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

There are 100,000 people that live in the suburbs of Toledo that work in the city.

The total cost (operation, maintenance, bus replacement and overhead) of each bus per hour is $35.

TARTA stands for the "Toledo Area Rapid Transit Authority."

d. Card #4

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

Local bus lines would connect with the rapid transit bus terminals (good connecting services).

There are 20,000 people that live in the city of Toledo and work in the suburbs.

TARTA is planning on operating 5 lines.

e. Card #5

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

10% of the people that live in the suburbs and work in the city have indicated they would ride buses to work if the services were good.

It takes 35 minutes for an average run on the line

There is parking for 2,500 cars downtown.

Toledo metropolitan area has 1,000,000 people.

f. Card #6

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

The Rapid Transit Bus system would carry passengers between the downtown area and the suburbs of Toledo.

25% of the people that live in the city and work in the suburbs have indicated they would ride the rapid transit busses to work each day (round trip) if services were efficient.

The Rapid Transit Bus fare would be 25 cents one way and free transfers available for local bus services.

4. Recommended procedure:

   a. Form the class into groups of six.

   b. Pass out the six bit cards to each group (one card to each member of the group.

   c. Give the following directions for the exercise:

      1. One member in each of the groups has a question to be solved by each group.

      2. Participants may not show their card to anyone.

      3. Participants may read the information on the card to anyone in their group.

      4. Some of the information on the cards may be irrelevant.

   d. Give the groups 15-20 minutes to solve or to work toward the solution of the problem.

   e. Ask any group to provide the answer to the question: revenue generated $7500 per day: costs $8750 per day.

5. Discussion questions:

   a. The difference between real and ritualistic listening.
   b. How did leadership unfold during the activity?
   c. How were decisions made?
   d. How effectively did the group function?
   e. How might the group have functioned more effectively?

Junior High

William B. Stapp
Talbert Spence

Common Squares

1. Skill area to be developed:

    a. The ability to determine own resources.
    b. The ability to determine other person's resources.
    c. The ability to define a problem.
    d. The ability to analyze data.
    e. The ability to work with a group.
    f. The ability to help solve a group problem. (how individual can contribute to solution and help others to contribute to solution.)

2. Time involved: 30 — 40 minutes.

3. Recommended procedure:

    a. Five members to a group.

    b. Provide instructions:

        1. Provide each group with five envelopes each with different size pieces to form the pattern of the common squares. (A,B,C,D,E)

        2. Instruct group members that throughout the entire activity there will be no verbal communication between them.

        3. The only communication permitted is when a member gives his team mate a piece that will help him solve his problem.

        4. Inform last group that the task is completed when each member of the group has a square in front of him/her identified in size to that of the other members of his/her group.

        5. After a group has successfully completed the task have them observe (with out talking) the other groups that are still working.

4. Materials needed:

    Five envelopes containing the appropriate pieces of construction paper.

5. Discussion questions:

   a. Who assumed the leadership in the group?

   b. Who was giving help in solving the problem? Were you?

   c. Did you accept help from other group members?

   d. Did you have a sense of security during the activity?

   e. Did you sense any signs of sexism in your group during the activity?

   f. Was there any signs of racism from group members?

   g. Was there group cooperation?

   h. Was there a total group effort to solve the groups problem?

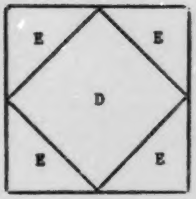
   i. Did your group work as a unit?

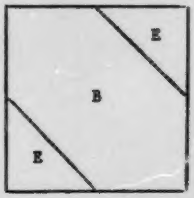
   j. Were you aware of not only your own resources (pieces of information — construction paper), but resources of others?

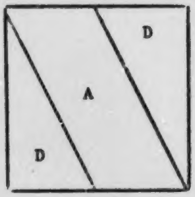
   k. At what point did you feel good?

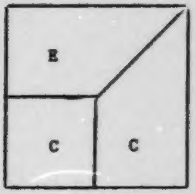
Pattern For Common Squares

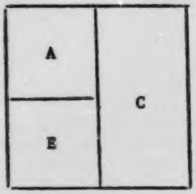
Cut Construction Paper into the Following Pieces
and Place in Envelopes "a-e" according
to the Letters Provided.











Junior High

William Stapp
Talbert Spence

Environmental Assets and Liabilities Survey
(A Micro-urban Investigation)

1. Skill areas to be developed:

   a. The ability to recognize a community environmental problem.
   b. The ability to listen carefully and accurately.
   c. The ability to define a community environmental problem.
   d. The ability to collect data.
   e. The ability to organize data.
   f. The ability to analyze data.
   g. The ability to develop a plan of action.

2. Time involved: 2 (hours).

3. Recommended procedure:

   a. Inventory in your local community the following information:

      1. List the environmental assets of the area (physical and visual).
         (e.g. Historic Landmarks, Natural Features, Structures with Visual Impact, etc.)

      2. List the environmental liabilities of the area (physical and visual).
         (e.g. Conflicting Land Use, Traffic Congestion, Residential Degradation etc.).

      3. Plan a 10 minute report that describes the following:

         a. The information collected;

         b. What general recommendations you might suggest to help improve one of the environmental assets or liabilities in the area.

         c. Social change strategy that you would advocate using to implement one particular environmental asset or liability in the area.

4. Discussion question:

Note: The following questions are designed to help you and students look for significant relationships between things in the environment. Time may not allow you to investigate all of the suggestions. Therefore, you will have to decide which things are most significant in the time allowed.

a. How do the environmental assets affect the rest of the community?

b. How do the environmental liabilities affect the rest of the community?

c. Which environmental assets have potential for serving as building blocks to improve the livability of this community?

d. What problems exist because of adverse environmental factors in the community?

e. What environmental problems in this community are related to regional environmental problems?

Senior High

William B. Stapp
Talbert Spence

Listening Triads
(Agree, Disagree, Questions)

1. Skill area to be developed:

    a. The ability to listen with comprehension.
    b. The ability to distinguish fact from fiction from statements discussed in Triads.

2. Time involved: 40 minutes.

3. Material needed: 8 Topic Cards.

    a. Card #1

        1.

        Human population increases throughout the world are serious. Science and technology cannot provide means for survival without limiting population growth.

    b. Card #2

        2.

        The burden of the price of eliminating pollution should fall on industry, rather than on the government, or the consumer.

    c. Card #3

        3.

        Responsibility for the West's neglect of the environment is to be found in the Judeo-Christian tradition with its axiom that nature exists to serve man.

d. Card #4

4.

A goal of society should be equitable distribution of socio-economic costs and benefits.

e. Card #5

5.

America's population poses a greater threat to the world ecosystem than India's.

f. Card #6

6.

The labor movement and the ecology movement are facing a showdown.

g. Card #7

7.

Human values and behavior are not easily changed. An "order model perspective" holds more potential for changing human values than a "conflict model perspective."

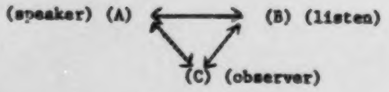
h. Card #8

8.

The environmental crisis cannot be solved in the context of our present political and economic system.

4. Recommended procedure:

a. Triads formed
   e.g. Traid



b. A Group given a list of topics to discuss.

c. Participant A speaks for 7 minutes from any of the topics from the topic list (or any other topic of their choice)

d) Participant B listens and after 7 minutes - - - summarizes, without notes, what he or she has heard.

e. Participant C is the observer. Participant C and the speaker listen to the summary and if incorrect they are free to interrupt and clear up any misunderstanding.

f. Shift roles for second round - 7 minutes.

g. Shift roles for third round - 7 minutes.

5. Discussion questions:

a. Was there difficulty in listening to others? Why?

b. Was there difficulty in formulating your thoughts while listening?

c. Was the summary shorter and more concise?

d. Were you able to communicate your thoughts clearly?

e. Did the manner of presentation affect your listening ability?

Senior High

Richard B. Sandys
Ron Garner
James D. Obenour
David H. Sandys

I Thought I Saw a ___?___

1. Skill area to be developed:
   a. The ability to collect data accurately.
2. Time involved: 30 minutes
3. Materials needed: the following displays
   a. One beaker of water (temperature approximately 98.6°F). The beaker should be large enough to submerse your hand in. In front of the display there should be written on a small piece of paper the question: What temperature is the water (cool, warm, etc.)?
   b. One study lamp with a red bulb or filter pointed at a yellow object. Question on paper in front: What color is the object?
   c. One study lamp with a blue bulb or filter pointed at a white object. Question: What color is the object?
   d. A piece of paper with a quoted statement such as: "Atoms are blue." Question: What color are atoms?
   e. See attached illustration marked E. Question: Which line(s) (is, are) longer?
   f. See attached illustration marked F. Question: What is the picure?
   g. A card bearing the following equation: 1 + 1 = 5. Question: How much are one plus one?
   h. A large double convex lens an inch or more in diameter. Question: While looking through the lens, what do you see differently?
   i. A piece of unfinished wood and a piece of metal. Question: Which is cooler?
   j. A tray of many small items, include four paper clips. Question to come later.
4. Recommended procedure:
   a. Prepare three sets of the listed displays (for 30 students) and put each set of (a) through (j) in separate areas of the classroom.

b. Divide the class into three groups of ten each. Put each student in front of a display, allowing ten seconds to answer the question and then rotating until each student has seen displays (a) through (j).

c. Have the students return to their desks and write their answers for each question on the board. (When question (j) comes up, write on the board: How many paper clips were on the tray? and then take answers.

5. Discussion questions:

   a. Why do answers vary?

   b. What would help to collect data more accurately? (Notations in parentheses refer to the displays that most likely illustrate the point.)

      1. More time (j, 10 sec. time limit).
      2. Standard conditions (b, c).
      3. Standards of measurement

         a. thermometer (a, i).
         b. ruler (e)

      4. Supporting evidence (d, g).
      5. Viewpoint (h).
      6. Personal opinions (f).
      7. More specific questions.

Illustration E

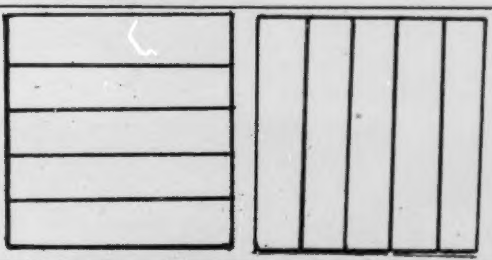
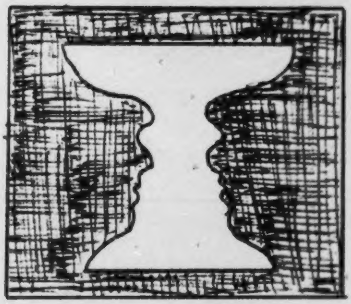


Illustration F



High School/Junior High

James D. Obenour
David H. Sandys
Richard Sandys
Ron Garner

Star Trek Terrarium

1. Skill area to be developed:
    - a. The ability to collect data.
2. Time involved: 1 hour
3. Materials needed: Vegetation key*, insect key, meter stick, tape measure, thermometer, string, specimen jars, compass, light meter (camera), watch paper.
4. Recommended procedure:
    - a. Introduce unit by stating objective
        1. Amount of data to be collected
            - (a) A minimum of 30 different facts
            - (b) The teacher or student may decide upon a different amount of data.
        2. Set up standards of measurement
            - (a) Use of Metric measurements, American measurements.
            - (b) Diameter of tree measured at shoulder height, etc.
    - b. Develop example
        1. Give the idea of precisely reproducing the area on another planet from the data obtained from given areas.
        2. Give a few problems which may arise
            - (a) Problem of counting all plants, and insects, estimating numbers.
            - (b) What each person will do in the group; let them decide.
        3. Allow questions and answers.

c. Form groups of four to six students.

d. Make all materials readily available to the students

    1. Students will not be told what materials to use, they will select their own.

    2. Students will also be encouraged to think of other materials they might want to use.

e. Allow 30 minutes of data collecting.

f. Collect group data sheets.

    1. Check data and hand back the next day.

    2. Discussion and questions

        (a) Was more information needed?

        (b) Did everybody collect data in each group?

        (c) What was the most important data needed to meet the objective?

        (d) How efficiently did each group collect its data?

        (e) How might each group have functioned more effectively?

Senior High

Denetra Balmer
Doris Jones
Blanche Edelman

Population Trends

1. Skill area to be developed:

   a. The ability to organize data.

2. Time involved: 30 minutes.

3. Material needed: Each student is asked to bring in the following information about his own family:

   a. Number of children in his family including all first cousins.
   b. Number of children in his mother's family.
   c. Number of children in his father's family.
   d. Number of children in his maternal grandfather's family.
   e. Number of children in his paternal grandfather's family.
   f. Number of children in his maternal grandmother's family.
   g. Number of children in his paternal grandmother's family.
   h. How many of these reached age 5?
   i. How many of these reached age 18?
   j. How many of these reached age 50?
   K. Oldest living?

4. Recommended procedure:

   a. Form the class into groups of four.
   b. Have graph paper available but don't volunteer it.
   c. Give the following directions:

      1. Pool information so that all statistics represent group totals for each category.

      2. Compile data so that a comparison of family size can be made, i.e., grandparents, parents, children.

   d. Following compilation of data, ask some or all these questions:

      1. What is the trend in family size in the three generations?

      2. What could account for the sameness or differences in size?

      3. What comparison can be made regarding infant deaths in the last 50 years?

4. What is happening to the family unit?

5. Why were big families once necessary?

6. What economic factors are affected by lowering family size (possibly amount of mfgd. goods, schools, etc.).

7. How can the population size be increasing when the family size is decreasing?

5. Discussion questions:

   a. How did the group compile the data? (by graph or verbal)

   b. Did they organize data well enough to be able to use the information to answer the questions readily?

   c. Was there cooperation in putting the information together or did one person do the arithmetic?

   d. Were the answers apparent to the members or did one or two individuals have to interpret the results for the group?

Variation: ask for report to include the identification of the number of girls and boys in each family so that number of survivals and longevity can be compared by sex.

High School

Demetra Dalmer
Blanche Edelmar
Doris Jones

Western Uranium Mining Company

1. Skill areas to be developed:

   a. Ability to organize data.

2. Time involved: one or prefereably two hours.

3. Material needed: map of present community and outline map of area for development, fact sheet on present community.

   Facts:

   a. Western Uranium Mining Company a small corporation has been bought by a group of environmentally concerned businessmen whose aim is to double the uranium extration while providing the best possible community development.

   b. Included on Company property is a town, populaiton 3,000, all of whom are directly or indirectly involved in the mining operation.

   c. Rich uranium deposits exist near the surface of the entire area; strip mining is the most efficient way of extracting the ore.

   d. The company owns all the land; it leases land for employees homes, stores, etc.

   e. The uranium extraction plant is situated near the river which supplies water for all purposes.

   f. The plant generates acid waste as well as expended rock.

   g. The new owners want to double the amount of land under mining operation.

   h. You are part of a planning group responsible for a ten year planning of the growth of the entire community: the mining, business, residentail, recreational, etc.

   i. Your job is to plan for the increased needs for the population as well as proper environmental practices in the mining operation.

4. Recommended Procedure:

   a. Divide class into groups of six.

b. Give each group one map of the present community; several copies of an outline map with only the river on it; a fact sheet about the town and mining company.

c. Ask each group to design a ten year plan for doubling community and mining growth.

d. You might want to have a discussion on general considerations involved in planning.

e. Give them one or two (preferably) hours to come up with a design.

5. Discussion:

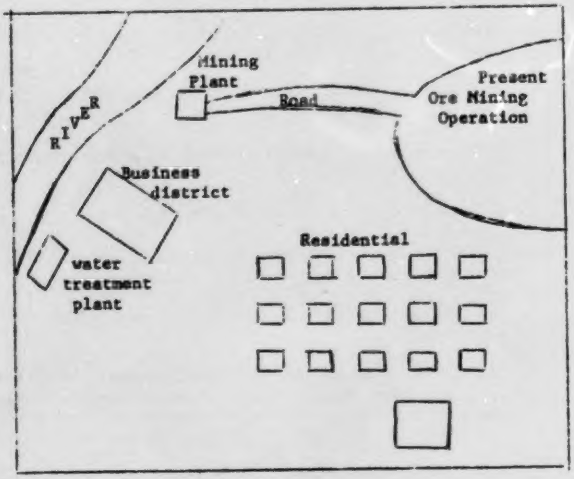
a. Did the members cooperate in deciding how the town should be organized?

b. Was there input from all members or did one or two make the decisions.

c. Did their plans reflect good environmental principles: adequate water treatment, pollution prevention measures; proper land use planning, reclamation of land after mining, school and recreational facilities, etc.

d. How did the final town plans differ from one group to another? Comparison of plans can be a lesson in values and alternatives.

Map of Present Town


Mining Plant
Road
Present Ore Mining Operation
RIVER
Business district
Residential
water treatment plant

Outline Map for use in Designing Future

Senior High

Donn Hellinger
Tim Kardatzke
Tim Kreps

Population & Land Perspectives

1. Skill areas to be developed:

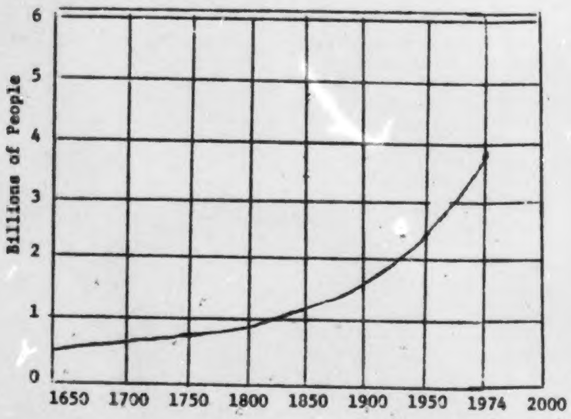
   a. The ability to listen.
   b. The ability to organize data.
   c. The ability to analyze data.

   d. The ability to draw conclusions.

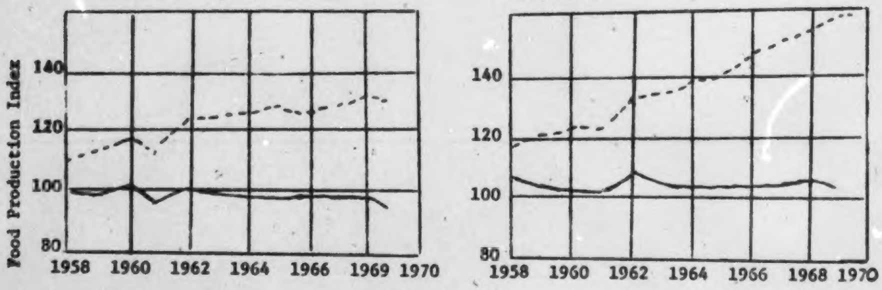
2. Time involved: 40-50 minutes.

3. Material needed: 4 data charts.

   a. World Population since 1650. Group 1

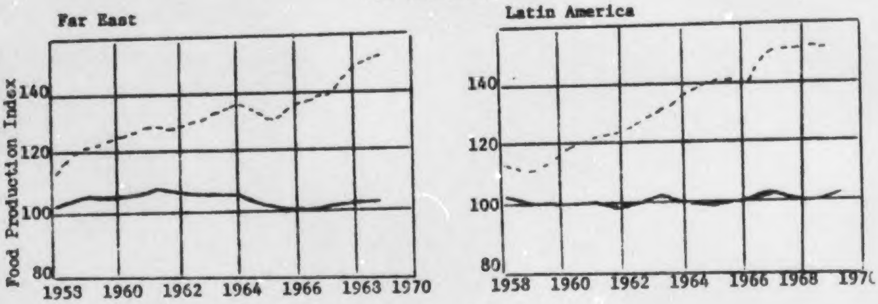


Food Production


Africa

Near East

Food Production



CAN YOU ANALYZE THIS DATA?

It may be helpful to analyze the population graph first. You may want to complete the population curve from 1970 to 2000.

After analyzing your graphs you may want to list the implications of the various curves.

Total food production - - - - - - - -
Per capita food production ————

b. Land Area of the Earth Group 2.

	Area in 100 km^2	Hectares per person 1970
Planet Earth	135,767	3.76
Poor Countries	78,040	3.05
Africa	30,313	8.61
Asia (except Japan)	27,162	1.41
Latin America	20,565	7.27
Rich Countries	57,727	5.49
Europe	4,929	1.06
Japan	307	0.36
North America	21,515	9.52
Oceania	8,511	44.79
USSR	22,402	9.26

CAN YOU ANALYZE THIS DATA

You may want to compare countries as well as groups of countries. Could the values of this data be somewhat misleading?

km^2 = square kilometers

Hectare = 2.47 acres

c. Population Estimates by Major Areas. Group 3.

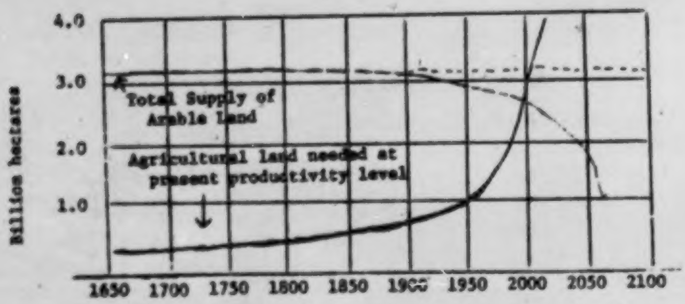
Area	1965	1970	1975	1980	1985
World Total	3289	3632	4022	4457	4933
More developed regions	1037	1090	1147	1210	1275
Less developed regions	2252	2541	2874	3247	3658
East Asia	852	930	1011	1095	1182
South Asia	981	1126	1296	1486	1693
Europe	445	462	479	497	515
USSR	231	243	256	271	287
North America	214	228	243	261	280
Latin America	246	283	327	377	435
Oceania	18	19	22	24	27

CAN YOU ANALYZE THIS DATA?

After analyzing your data you might want to list the implications of this type of growth curve.

d. Arable Land.

Group 4



CAN YOU ANALYZE THIS GRAPH?

Arable land is land which can be cultivated.
Hectare = 2.47 acres.
About 0.4 hectares per person of arable land are needed at present productivity.
Could the labled values of this graph be somewhat misleading?
After analyzing your graph you might want to list the implications of this land use curve.

4. Recommended procedure:

a. Divide the class into four groups.

b. Pass out one type of graph or table to each group. (each member of the group should have the same table or graph).

c. Give the following directions for the exercise:

(1) Each group has a different graph or table relating to population land or food.

(2) Each group is to analyze their information and record their findings. For example: You may find trends or significant differences in various groups of data.

(3) One person in the group should record your ideas and findings.

(4) You will have approximately 10-15 minutes to analyze your data and generate ideas.

d. The teacher should circulate among the groups. After allowing the groups sufficient time to generate their own ideas, the teacher may suggest one or more of the "idea stimulators", if necessary.

e. After the individual group analysis, combine groups 1&2 and 3&4. Each half of the group should explain their data and findings to the other half of the group. Example: 1 explains to 2 and vice versa. Then the group should discuss the relationships of their information and record their findings.

f. The teacher should allow 15 minutes or so for idea formulation.

g. If there is still time available, the teacher may have a representative or two from each group present their findings. A class discussion could follow.

h. Analysis of this data should bring forth these ideas:

(1) The earth ecosystem is an interacting and interdependent complex.

(2) Population is increasing at an exponential rate.

(3) Arable land is a finite resource.

(4) As population increases each year, we are loosing more aerable land to development.

(5) The poorest countries and sections of the world seem to have the largest populations and the least amount of land.

(6) Total food production in the non-industrial regions of the world has risen at about the same rate as the population. Thus food production per capita has remained nearly constant, at a low level.

(7) The problems of population growth, food production, and land use are extremely difficult and complex.

5. Discussion questions:

   a. What type of growth rate does the graph suggest? Linear? Exponential?

   b. Why is the curve sloped so sharply upward?

   c. What are the implications of an exponential growth curve?

   d. How is the population distributed?

   e. What are the implications of this type of population distribution? Is the population evenly distributed?

   f. How does human population growth relate to the rest of the earth ecosystem?

   g. Is land evenly distributed according to the population distribution?

   h. Is all of the land listed in the table available for human use? Explain. 17% Desert Regions, 12% Mt. Regions, 29% Ice Caps and Tundra.

   i. Will the total supply of arable land (3.2 billion hectares) always remain the same? Explain.

   j. What does the line "agricultural land needed" also represent?

   k. What are the implications of this kind of arable land use curve?

   l. Has food production remained constant?

   m. Has food production per capita remained fairly constant? Why?

   n. How does food production, population growth and distribution; and land use and distribution interact within the earth ecosystem?

6. References:

Meadows, Donella H. & Dennis L. The Limits to Growth. Potomac Associates, Washington D.C., 1972.

Murdock, William W. Environment. Sinauer Associates, Inc., Stamford, Conn., 1971.

Senior High

William B. Stapp
Talbert Spence

The Colonization of Aquarius

(person, age, sex, nationality, ethnic-class job-skills)

1. Skill areas to be developed.

   a. The ability to listen carefully.
   b. The ability to analyze data.
   c. The ability to work with a group (decision making).
   d. The ability to make group decisions.

2. Time involved: 40 minutes.

3. Recommended procedure:

   a. Group students in team 5-6 members to work together on solving the colonizations of Aquarius.

   b. Give each team member a copy of the endorsed handout.

   c. Have each student take 10 minutes to make individual selections.

   d. Read the following statement to the group:'

Instructions:

This is an exercise in group decision-making. Your group is to employ the method of group concensus in reaching its decision. This means that the placement under level of intensity for each of the twelve grievances must be agreed upon by each group member before it becomes a part of the group decision. Concensus is difficult to reach. Therefore, not every ranking will meet with everyone's complete approval. Try, as a group, to make each ranking one with which all group members can at least partially agree. Here are some guides to use in reaching concensus:

1. Avoid arguing for your own individual judgements. Approach the task on the basis of logic.

2. Avoid changing your mind only in order to reach agreement and avoid conflict. Support only solutions with which you are able to agree somewhat, at least.

3. Avoid "conflict-reducing" techniques such as majority vote, averaging, or trading, in reaching your decision.

4. View differences of opinion as helpful rather than as a hindrance in decision-making.

e. Have the groups take about 15 minutes to make a group ranking and decision as to whom will make the trip to Aquarius.

f. Have each group determine differences between individual and group ranking.

4. Materials needed:

   a. The Handout on "Colonization of Aquarius"

5. Discussion questions:

   a. Who took the leadership position in your group?

   b. Were you a good listener?

   c. Was there any statements or actions by group members that gave you the feeling that the group was being sexist?

   d. How did your group arrive at their decision?

   e. During the selection process was there any racism — consciously or unconsciously by group members?

   f. Who had the most influence over your decision? The groups total decision?

THE COLONIZATION OF AQUARIUS

Aquarius is the name given to a small planet that orbits a Sol-type sun, just to the right and a little beyond Polaris, the North Star. Discovered in the year 2073 by the Caselton Expedition, Aquarius is reported to be a bit smaller than Earth. Like Earth, the planet's surface is mostly water, with two large land masses and three smaller ones, all of them large enough to be considered continents.

Aquarius has abundant plant and animal life on its surface and in its waters, but no traces of intelligent life have been discovered by the previous exploratory parties.

Because Aquarius is very much like Earth with good air and water and soil, it has frequently been considered for colonization. After much preparation, the colony is about to be established. The supplies have been gathered and are waiting on the ship. The only question is .... who will be the colonizers?

Directions:

1. Your group is the committee that will decide which persons will go to Aquarius. Below is a list of 15 short descriptions of persons who have applied and are considered suitable. But, because of space limitations not all will be able to go. (There appears to be room for only 10 persons, however, it is unknown exactly how many persons will be going.) The colonists will be supplied from Earth regularly, but there will be NO additional personnel added to the colony for at least 20 years.

2. It will be up to you to make the selections following the guidelines:

   a. Each individual is to take about 10 minutes to make his own selections by ranking the persons 1 through 15 in the space provided. Number 1 is your first choice for colonization, etc.

   b. After the individual rankings are finished, your group will meet for 15 minutes to make its final decision. The group is to rank each person in the spaces provided. ALL MEMBERS OF THE GROUP MUST AGREE ON EACH RANKING.

   c. It is permissible to attempt to influence the rest of your group, but try to avoid arguing for your own rankings, look for alternatives, avoid changing your mind only in order to avoid conflict, avoid conflict reducing techniques such as majority vote or averaging.

THE COLONIZERS:	INDIVIDUAL RANKING	GROUP RANK	DIF.
Dave Doleson, 36 yrs, auto and truck mechanic and amateur archeologist American, white.	___	___	___
Laura Lee, 26, physical therapist, expert on coral formations. Chinese-American from Hawaii,	___	___	___
Charles Dubois, 41, architect and City planner, French,	___	___	___
Michael Rech, 34, Prize winning journalist, author, TV newsman, Israeli.	___	___	___
Richard Lee, M.D. 48, general practitioner, American-Black.	___	___	___
Evelyn Ansell, 50, dietician and home economist, British.	___	___	___
Doris Eberly, 37, Electronic engineer, Austrailian.	___	___	___
Fred Davison, 41, carpenter and plumber, Danish.	___	___	___
Dr. Cynthia Phillips, 32, Micro-Biologist and ecologist, American.	___	___	___
William Jamison, 47, millionaire, president of a large corporation, sportsman, and big game hunter, American.	___	___	___
Henry Bortner, 36, dairyman and farmer, German.	___	___	___
Emily Payne, 27, High School English & history teacher, British.	___	___	___
Peter Michelson, 20, University student & amateur skin diver, Swedish.	___	___	___
Henry Banks, 50, surveyor-construction supervisor, British.	___	___	___
Marlene Richardson, 26, concert violinist and guitarist, American-Black.	___	___	___

Senior High John T. Murnen

Ten Questions

1. Skill to be developed:

   a. The ability to generate alternative solutions.
   b. The ability to recognize useful data.
   c. The ability to analyze data.
   d. The ability to draw conclusions.

2. Time involved: one class period.

3. Material needed. Ten Environmental Problem Cards.

   a. Card #1

      Decay of inner city housing

   b. Card #2

      Air pollution caused by automobiles.

   c. Card #3

      Pollution of water by farm runoff.

   d. Card #4

      Pollution of air caused by factory waste.

   e. Card #5

      Littering of landscape by debris thrown from cars.

   f. Card #6

      Accumulation of junk cars.

   g. Card #7

      Pollution of water from factory waste.

   h. Card #8

      Disposal of throw-away containers.

   i. Card #9

      Littering of yards and alleys by trash.

j. Card #10

Noise caused by large airliners.

4. Recommended procedure:

    a. Post the six solutions on the board.

        1. Pass a law to help solve the problem.
        2. Pass a local tax to pay for elimination of problem.
        3. Make each individual pay for and eliminate the problem himself.
        4. Receive federal assistance to solve the problem.
        5. Forget about it - it's not a serious problem anyway.
        6. Enforce present laws.

    b. Place each card in an overhead projector. Have each student read the card and choose the solution which they think is best. Give them one minute on each problem.

    c. After this is done, take each problem individually and compare and discuss the alternatives. Make a chart to indicate the percentage of each solution chosen for each problem.

5. Discussion questions:

    a. Is there only one solution to each problem?

    b. What factors must be considered when developing alternative solutions to a problem (i.e., social, economics, technological)?

Senior High

Ron Garner
James D. Obenour
Richard Sandys
David Sandys

Mass Transit

1. Skill areas to be developed:

    a. The ability to collect data.
    b. The ability to organize data.
    c. The ability to analyze data.
    d. The ability to generate alternative solutions.
    e. The ability to draw warranted conclusions.

2. Time involved: 40 minutes

3. Materials needed: Maps (samples attached)

4. Recommended procedure:

    a. Form groups of four or of any appropriate working size for your classroom.

    b. Pass out one set of maps to each group.

    c. Explain the exercise:

        1. Each group is to consider the feasibility of a land mass transport system for the country.
        2. Tell the students to study the maps.
        3. Have each group draw what they think is the best land mass transit system on a given blank map. They should consider:

            Where should the terminals be and why?

            Where should the routes go and why?

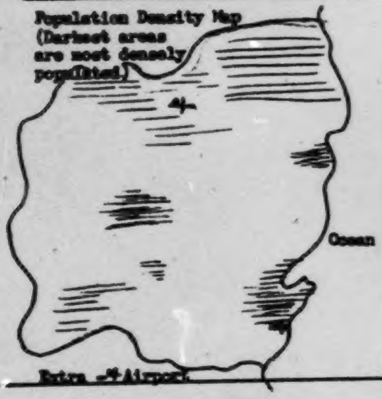
            What problems will arise for each route?

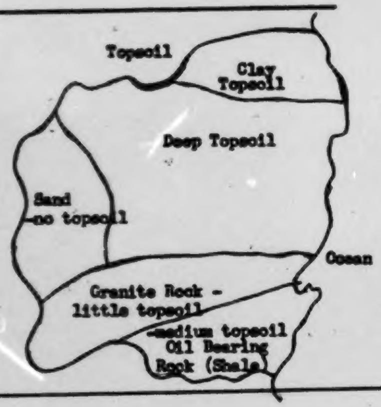
            What information is available concerning each possible route?

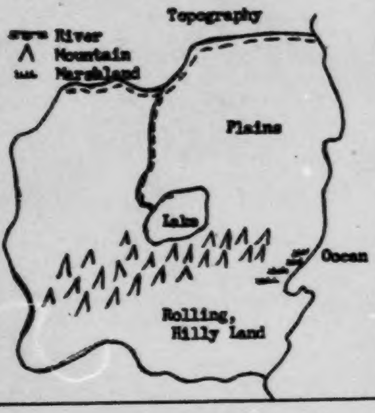
    d. After 20 minutes have a few groups report their chosen routes. Open a discussion to debate the routes among the groups.

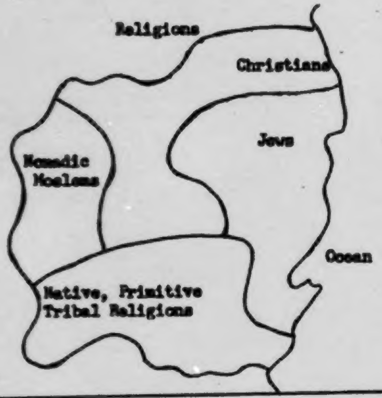
5. Discussion questions:

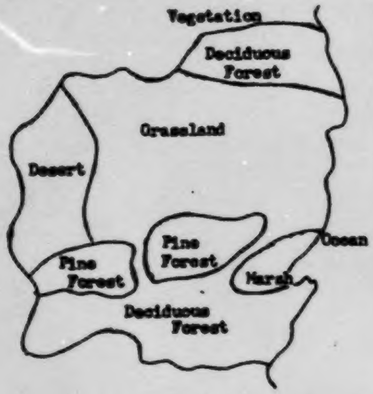
    a. What maps were of the most use and why?
    b. What maps were of the least use and why?
    c. How were decisions made?

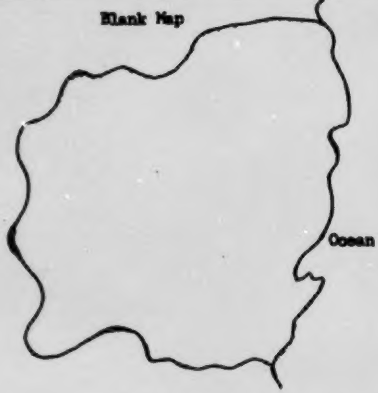

Population Density Map
(Darkest areas
are most densely
populated)
Ocean
Extra -✈ Airport


Topsoil
Clay
Topsoil
Deep Topsoil
Sand
-no topsoil
Ocean
Granite Rock -
little topsoil
-medium topsoil
Oil Bearing
Rock (Shale)


Topography
River
Mountain
Marshland
Plains
Lake
Ocean
Rolling,
Hilly Land


Religions
Christians
Jews
Nomadic
Moslems
Ocean
Native, Primitive
Tribal Religions


Vegetation
Deciduous
Forest
Grassland
Desert
Pine
Forest
Pine
Forest
Marsh
Ocean
Deciduous
Forest


Blank Map
Ocean

Senior High John T. Murnen

Exercise in Alternatives

1. Skill area to be developed:

    a. The ability to generate alternative solutions.

2. Time involved: 45 minutes

3. Material needed: Pen and one copy of "Exercises in Alternatives"

    a. Mrs. Biddle is an elderly widow who lives by herself. The city refuse department has decreed that the collectors will pick up only three garbage cans and that they must be carried to the curb. She has tried but can not possibly get all her garbage in three cans. She has appealed to the city that she is not strong enough to carry out the cans. Their reply was that that was her problem. Can you make several suggestions that might help Mrs. Biddle?

    b. You are lost in the Rocky Mountains and after two days you have run out of food. You have only a knife with you and a canteen of water. List three ways in which you could obtain food and water on which to survive.

    c. Smoking in the school restrooms has become a serious problem. Last semester two small fires were discovered in the lavatories believed to be caused by discarded cigarettes. The school board has issued an edict to put a stop to the smoking. A rule against smoking has been passed, but it still persists. Can you suggest three methods of overcoming this problem?

    d. Farmer Jones lived on an island seven miles out in Lake Michigan. The electric cable leading to his island that supplied power to run his appliances and lights was severed and could not be repaired for three months because of the ice. He tried using gasoline powered generators to supply his electrical needs but found it too expensive. Can you list two possibilities which Farmer Jones could turn to in his time of need?

    e. In the year 1980, all of the low areas in and around your community that can possibly be used for landfill have been completely filled. The use of incinerators was examined to take care of the refuse, but was found to be too expensive and also a detriment to the quality of the air. What would you suggest as an alternate means of disposing of all the debris and garbage produced by the more than half a million people who live in this metropolitan area?

4. Recommended prodedure:

    a. Pass out one copy of the problems to be solved.

    b. Each person is to work alone.

   c. Give the students 30 minutes to develop alternatives.

   d. Suggest that they try to come up with practical and workable solutions.

   e. Compare and discuss the alternatives after 30 minutes.

5. Discussion Questions:

   a. How did you approach the topics? Go around the circle giving each participant a designated amount of time. Brainstorm the alternatives.

   b. Did all members participate in the activity?

   c. Were members of the group that had experienced the situation more helpful to the group?

The Disappearance of the Tigris-Euphrates Civilizations

1. Skill areas to be developed:

   a. The ability to listen with comprehension.
   b. The ability to recognize a problem.
   c. The ability to organize data.
   d. The ability to analyze data.
   e. The ability to draw warranted conclusions.

2. Time involved: 20 minutes.

3. Materials needed: Six information cards

Card I.

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

Opening statement-- The Tigris-Euphrates valley was once a land suggestive of the Garden of Eden, a rich, productive land whose people lived well, built flourishing cities, established governments, and developed the arts.

Lands formerly occupied by Semitic peoples are now mostly desert.

The famous hanging gardens of Babylon were probably terraced slopes.

The Mesopotamians gradually died out or became nomads.

(Some of the information provided may be irrelevant.)

Card 2

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

Gradually the fertility of the valley deteriorated because of forest cutting, erosion, quick runoff and overgrazing.

It takes 300-1000 years for one inch of topsoil to be created by nature.

Agricultural land was in a state of high use

The Cradle of Civilization became a desert.

(Some of the information provided may be irrelevant.)

Card 3

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION TO ANYONE IN YOUR GROUP.

The valley inhabitants introduced a complex and extensive system of irrigation works about 2000-1700 B.C.

Hammurabi's Code required a 2 shekel fine and restoration if an irrigation ditch was allowed to fall into disrepair death on the second offence.

Terraces require much labor to maintain in a state of fertility and to minimize erosion.

It was a mistake to build terraces because a break on the upper levels is magnified on the lower levels.

(Some of the information provided may be irrelevant.)

Card 4

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION TO ANYONE IN YOUR GROUP.

The Babylonian economy was basically agricultural.

Irrigation improved the production of the valley.

For several centuries after 1525 B.C. civil war was constant and the armies destroyed, plundered and deforested the region.

Babylon fell to invaders with superior weapons.

(Some of the information provided may be irrelevant.)

Card 5

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION TO ANYONE IN YOUR GROUP.

The Sumerians and Babylonians developed an advanced agriculture.

Hammurabi's Code had an extensive section devoted to irrigation and agriculture.

Armies blocked water supplies to urban areas.

Grains, vegetables and fruits were raised plentifully in this fertile region.

(Some of the information provided may be irrelevant)

Card 6

YOU MAY NOT SHOW THIS CARD TO ANYONE IN YOUR GROUP. YOU MAY READ THE INFORMATION ON THE CARD TO ANYONE IN YOUR GROUP.

Sumerians apparently took better care of their land than the Semitic Babylonians.

Enemies such as the Hittites (1600 B.C.) and Kossites (c. 1525 B.C.) wrecked and blocked the vital irrigation canals.

Deforested hilly land was preserved, as early as 2000-1700 B.C. by a system of terraces (similar to contour plowing), replenishment by organic materials and control of water to all levels.

Wars and invasions took a toll of the labor supply.

(Some of the information provided may be irrelevant.)

4. Recommended procedure:

   a. Form the class into groups of six.
   b. Pass out the cards to each group (one to each student).
   c. Give the following directions for the exercise.

      1. Participants may not show their cards to anyone.
      2. Participants may read the information on the card to anyone in their group.
      3. Some of the information may be irrelevant.
      4. The holder of card one begins the exercise with the "opening statement".

5. Discussion questions:

   a. How might the Tigris-Euphrates valley have been a lush, fertile area yet today?

   b. Could the fate of America be the fate of the Tigris-Euphrates valley?

   c. Were there any non-natural causes involved in the destruction of the valley?

Sources: Our Plundered Planet, Fairfield Osborn, Little, Brown & Co., Boston, 1948
Story of Mankind, Toledo History text.

Senior High

William B. Stapp
Talbert Spence

A Micro-urban Investigation

1. Skill areas to be developed:

    a. The ability to recognize and define a community environmental problem.

    b. The ability to listen carefully and accurately.

    c. The ability to collect and organize data.

    d. The ability to analyze compiled data.

    e. The ability to develop a plan of action.

2. Time involved: Two hours or as much time needed to do an accurate study.

3. Materials needed:

    a. Cameras
    b. Cassette tape recorders
    c. Chart paper and magic markers.
    d. City directory listing all social services and their facilities.

4. Recommended procedures:

    a. An inventory in the local community investigating available public facilities and services provided for the urban population.

    b. Have student group into research teams investigating and listing relevant and essential public facilities and services in the area.
    (e.g. Health Services; Senior Citizen groups; Recreation Centers, Welfare; Waste Disposal; police, fire, etc.)

    c. Have students group the various facilities and services listed during brainstorming session into appropriate categories.

    d. Delegate to each research team one of the categories created to do an investigation dealing with what actually goes on at the various facilities also what specific services are provided by these social agencies.

e. Have students identify and hopefully interview some of the public who use the various public facilities and services being studied.

f. Have students collect data and prepare a 10 minute oral presentation about their findings, touching on the following points.

   1. What is the basic philosophy of these organizations?

   2. Are these facilities and services designed for one segment of the population/ or multiracial?

   3. What are the advantages and disadvantages to facilities and services of this nature?

   4. Who makes the administrative decisions for these facilities and services. (city government, private foundation, community chest, etc.).

   5. Suggestions for improvements in the present administrative structure and decision making of these facilities and services.

   6. Possible suggestions for new facilities and services that will meet the unmet needs of the urban communities.

5. Discussion questions:

   a. What reasons can you give for the locations of each of the community facilities and services listed?

   b. What basic needs of people are being met by the existing community facilities and services?

   c. What basic needs are not being met by existing community facilities and services?

   d. What problems are associated with the quantity and quality of community facilities and services in this area?

   e. Which of the problems are related to regional environmental problems?

f. Which of the problems are related to just city environmental issues? To state, national, and international environmental problems?

g. What was your initial feeling about your visit to the community agency? (warm-friendly, or cold detached?)

h. Are there any advantages or disadvantages in doing a survey of this nature? (understanding the limited time and materials)

i. What kind of interactions did you have with other members of your research teams? Was it easier to work together than alone on this project? Did you feel unimportant at any time during the course of the teams investigation?

Senior High

William B. Stapp
Talbert Spence

Force Field Analysis

1. Skill areas to be developed:
   - a. The ability to recognize and define a problem.
   - b. The ability to recognize a central issue of a problem.
   - c. The ability to collect data.
   - d. The ability to analyze data.
   - e. The ability to develop alternatives.
   - f. The ability to evaluate alternatives.
   - g. The ability to develop a plan of action.

2. Time involved: 45-60 minutes.

3. Materials needed: Handout sheets on "Force Field Analysis"

4. Recommended procedure:

   - a. Divide the class into groups of four or five.

   - b. Have students identify a problem and a goal on a force field analysis sheet.

   - c. Have groups identify the driving forces related to their goal.
     (e.g. self, others and situation)

   - d. Have each group identify restraining forces, (self, others and situation) related to their goal.

   - e. Have groups determine possible actions that can be taken.

   - f. Have each group identify the resources that are available and have access to and in need of.

5. Discussion questions:

   - a. What are the possible advantages of using a strategy of this type in solving everyday problems? What disadvantages?

   - b. Who assumed the leadership role in your group? Did this cause you to participate more freely? Why? or why not?

c. How did your group decide upon a topic for the problem during this activity? Was everyone in agreement with the selection and its major goal?

d. Did you have a sense of security while being a member of your group? Why or why not?

e. What were the major issues thrown around during the brainstorming period that your groups came up with?

e. Were you able to communicate your thoughts clearly?

f. Was there any difficulty in listening to other members of the group? Why?

Force Field
ANALYSIS SHEET

Problem		Goal
Major Environmental Crisis: High School students total disregard for the conservation of the urban environment	→	to develop and help urban high school students acquire a basic understanding of the biophysical environment of urban environments in order to save the urban ecology.

Driving Forces		Restraining Forces
My dedication to the preservation of urban environments — and the instructing of young and old alike in the understandings and importance of maintaining the urban ecology.	**Self**	Societies — acceptance of the throwaway-philosophy — societies close-minded view to change.
Community leaders who share the same basic understandings, that in order for the quality of life and environment of urban poor people to improve they must take part in the revitalizing and change of the urban communities.	**Others**	Many individuals in the urban communities don't want to become included because they feel it's not their duty to take part in the uplift of the urban poor.
Urban environmentalist working in a major urban community	**Situation**	lack of financial aid to implement education programs.

Possible Actions

Form student coalitions to start defining and correcting the behavior of most young people about urban environments and the wealth they obtain. - Massive re-education efforts by public schools.-

Have Access To:	Resources	Needed:
Model City Booklets		Community Planning Booklets. Additional Names of Community Leaders.

SECTION IV

VALUES CLARIFICATION ACTIVITIES

SECTION IV

VALUES CLARIFICATION ACTIVITIES

Children and youth of today are confronted by many more choices than in previous generations and will soon be required to make many more environmental decisions affecting their community, nation and world.

The complexity of our times and of environmental decisions has made the act of choosing exceedingly difficult. Ideally, choices are made on the basis of one's underlying values; however, frequently persons (especially young people) are not clear about their own values.

The Values Clarification Process is concerned with trying to help students to become more aware of their own beliefs, attitudes and values; to consider and weigh the pros and cons and consequences of various alternatives; to consider whether their actions match their stated beliefs and if not, how to bring the two into closer harmony; and finally, to try to give students options, in and out of class, for it is only when students begin to make their own choices and evaluate the actual consequences, that they develop their own set of values.

The following are sample Values Clarification strategies that teachers have found helpful in assisting students to clarify their values regarding environmental issues. Though some strategies are recommended as being more appropriate for particular age groups, feel free to change and adapt them for your own uses.

As you become more familiar and comfortable with using the Values Clarification process, you will find that it can easily be included into any kind of teaching unit.

The following are guidelines to be considered by the teacher in handling values in the classroom:

a. When using activities and strategies for values clarification, encourage a classroom atmosphere of openness and honesty where diversity of opinion is encouraged and the opinions of others are respected.

b. The teacher should strive to help the class learn to listen to one another. One of the best ways to do this is for the teacher to be a model of a good listener.

c. When dealing with values the focus should be on the "process of valuing", not on the transmission of the "right set of values."

d. Valuing approaches should be used which will help students become aware of values they hold and prize.

e. Assist each student to build her or his own set of values.

f. Assist each student in considering alternatives, the consequences of each alternative, and her or his personal feelings toward each alternative before he or she acts.

g. Assist each student in considering whether her or his actions match her or his stated beliefs, attitudes and values and if not, how to bring the two into closer harmony.

h. Whenever a student does not want to respond to a valuing activity, he or she should be given the right to pass.

i. The teacher should participate in the valuing exercises and discussions whenever possible. The best time for the teacher to give her or his view is usually toward the end, after the students have had a chance to think things through for themselves and to express their own points of view. The teacher should express herself or himself as a person with values of her or his own. Thus the teacher shares her or his values, but does not impose them.

All Grade Levels Glen Erickson

Name Card

1. Time involved: five - ten minutes.

2. Materials needed:

    a. 3 x 5 notecards, one per person.

    b. Pen or pencil.

3. Recommended procedure:

    a. Have participants write their name in center of the card.

    b. Have participants write in the four corners the following information:

        1. Upper left - list 3 things you really value.

        2. Lower left - list 3 figures (alive or dead) that you really admire.

        3. Upper right - list 3 things that you would like to be remembered for after you die.

        4. Lower right - what do you feel are the 3 most serious environmental problems.

    c. Have participants break into groups of 3 and discuss one corner of their cards.

    d. After 2 or 3 minutes, rotate people to other groups, have them then discuss another corner of their cards.

4. Debriefing:

    a. Name Card is a mixer-type activity, used to get participants acquainted.

    b. Helps participants publicly affirm their values.

5. References:

Simon, Sidney, Leland Howe and Howard Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York: Hart Publishing Co., 1972.

All Grade Levels **Glen Erickson**

Voting Questions

1. Time involved: 10-30 minutes.

2. Materials needed: none

3. Recommended procedure:

   a. The teacher reads aloud each question by asking "Are you someone who...?"

   b. After each question is read the students take a position by a show of hands:"

      1. Those who strongly agree raise the hand high.
      2. Those who agree raise their hand slightly.
      3. Those who disagree lower their hand slightly.
      4. Those who strongly disagree lower the hand fully.

   c. Discussion can follow either each question or after several questions.

   d. This activity can also be written down on a worksheet.

4. Sample valuing questions: Examples for Lower and Middle Elementary grades. Are you someone who:

   a. Would like to live on a farm?"
   b. Likes to go on long car trips?"
   c. Would like to live in a different city someday?"
   d. Thinks you will smoke cigarettes someday?"
   e. Has a private place to go when you want to be alone?"
   f. Would like to plant something and watch it grow?

   Examples for Upper Elementary - Junior High grades. Are you someone who:

   g. Could live happily without electricity?
   h. Could enjoy living in a rural setting?
   i. Would go to school if you didn't have to?"
   j. Would like to change something about this school?"
   k. Would like to live in another country?"
   l. Would ask your parents or someone else you care about to stop smoking?"
   m. Likes to walk or ride a bicycle to a place rather than be driven?
   n. Would like to ride a motorcycle?"

Examples for Secondary Grades. Are you someone who:

- o. Would buy only returnable bottles if both returnable and nonreturnable bottles were present in a store?
- p. Feels modern technology will enable man to continue to enjoy the present standards of living for many decades to come?
- q. Feels as long as we have to go through democratic processes to make changes, there is no chance of our moving fast enough to save the environment?
- r. Feels that the population problem has a powerful magnifying effect on all our environmental problems?
- s. Would prepare your glass, cans and paper for recycling if it were available?
- t. Thinks that we should have spent all that money to go to the moon?*
- u. Would like to own a snowmobile?
- v. Uses a spray deodorant?

5. Debriefing:

- a. Voting questions call for public affirmation of one's values.
- b. Discussion is very important. You can discuss male and female differences.
- c. Example debriefing for spray deodorant issue: The first spray deodorant came out about 12 years ago. Now 90% of the population uses spray deodorant. How could we change school or the race issue as quickly?
- d. Just ask each question and go on unless students want to discuss.

6. References:

Simon, Sidney, Leland Howe and Howard Kirschenbaum, Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York: Hart Publishing Co., Inc., 1972.

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* Procedure 3b and Sample valuing questions a,b,c,d,e,i,j,k,l,n and t have been reprinted by permission of Hart Publishing Company, Inc., from its copyrighted volume VALUES CLARIFICATION: A Handbook of Practical Strategies for Teachers and Students by Sidney B. Simon, Leland W. Howe and Howard Kirschenbaum.

All Grade Levels

Glen Erickson

Physical Continuum

1. Time involved: 10 - 20 minutes.

2. Materials needed.

   a. Two blackboards or large pieces of paper.
   b. Can also be done with two projectors and appropriate slides.

3. Recommended Procedures:

   a. Place blackboards on opposite sides of room.

   b. Clear area between blackboards.

   c. Write pairs of issues on boards.

   Example City (on one board) - Country (on other board).

   d. Explain to group the choices involved, noting that choices exist from one board to the other board.

   e. Have participants place themselves along the imaginary line between the two boards which have opposite values listed on them.

   f. It is best if you eliminate the possibility of someone standing half-way between boards, so participants must make a choice.

   g. After people have aligned themselves, have them discuss amongst those adjacent to them, their reasons for placing themselves where they did along the physical continuum.

   h. Have people readjust their position, with respect to those people nearest them, to more accurately associate their position on the continuum with their personal value.

   i. Select individuals to relate to the group their reasons for their physical position on the continuum.

   j. Go on to next pair of values and repeat procedure.

4. Sample valuing questions:

   a. City - Country

   Which place would you rather live in?
   Which place would you rather work in?

b. Powerboat - sailboat

Which would you rather own? (both items identical in price.)

c. Snowmobile - cross country skiing.

Which would rather do?

d. Have group suggest other contrasting value statements.

5. Debriefing:

a. Note the importance of people, physecially and publicly affirming their values to better clarify them.

b. Participants can physecially see how their values relate to the values of other group members.

c. No position is right or wrong.

d. Sharing out reasons for individual positions among group members important in clarifying individual positions.

e. Any two contrasting value statements can be used that apply to the group.

6. References.

Simon, Sidney, Leland Howe and Howard Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

Upper Elementary
Junior High
Senior School

Glen Erickson

Values Continuum

1. Time involved: 20 - 30 minutes

2. Materials needed: 3 chairs or desks

3. Recommended procedure:

    a. Arrange 3 chairs or desks in a row, leaving several feet in between each so as to form 4 separate areas along a line.

    b. Explain to the class that you are going to read several value-related statements for which they are to respond by walking to the area which represents their position on the statements.

        1) The spaces should symbolize, left to right, strongly agree, agree, disagree, strongly disagree.
        2) Of course, any student may pass, and not respond.

    c. After each question, have a few students share out their reasons for the particular positions.

    d. Continue this same procedure for other statements.

    e. Let the class or yourself suggest other value statements.

4. Sample valuing questions:

    a. More emphasis should be given to problems of environmental nature which are caused by the individual citizen instead of problems which are caused by industrialists.

    b. The concept of cycles is encountered frequently in ecology. Yet, modern society is ignoring this basic law in its uses of natural resources.

    c. It is primarily the responsibility of the government to control air pollution.

    d. The environmental crisis cannot be solved in the context of our present political and economic system.

    e. Any pollution act of a person is an infringement on the rights of another and should be so regarded in the courts.

    f. Local organization is the key to effective environmental action; that is, battles on big national issues are ultimately based on grassroots supports.

g. As long as we have to go through democratic processes to make changes, there is no chance of our moving fast enough to save the environment.

h. There should be commuter taxes levied on persons who live in the suburbs and work in the central city, and the money used for the construction and improvement of public transit.

i. Modern technology will enable man to continue to enjoy the present standards of living for many decades to come.

j. The younger generation in America really does not want to change the basic way of life in this country.

5. Debriefing:

a. If students tend to cluster together because of peer pressure, you can have the students answer the statements on paper.

b. A wide spread of positions usually indicates a good continuum statement, which causes critical thinking.

c. This activity is good for introducing a particular unit by making statements pertaining to that unit.

6. References

Simon, Sidney; Leland Howe and Howard Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teacher's and tudents. New York, Hart Publishing Co., 1972.

All Grade Levels **Glen Erickson**

Twenty Questions

1. Time Involved: 15 minutes
2. Materials Needed:
   - a. pencil and paper
   - b. blackboard
3. Recommended Procedures:
   - a. Ask the students to write on a piece of paper the number 1-20.
   - b. Now have them list twenty things they enjoy to do.
   - c. Have students evaluate their list according to the code explained in Debriefing.
4. Sample Valuing Questions:
   - a. These can be "big" things in life, or "little" things.*
   - b. The students might want to think in terms of the seasons of the year.*
5. Debriefing:
   - a. Put the following code on the blackboard for the students to use in evaluating their 20 things.

     $ -- anything that costs over $20 to do
     S -- things you learned in school
     P -- things that pollute or degrade the environment
     N -- things you do in the natural environment
     A -- things you do alone
     Pa-- things you do or did with your parents
     5y-- things you didn't do five years ago
     R -- things that involve risk
     F -- things that you do with your friends
   - b. Several code items may be used for each of the twenty things.
   - c. The code provides a way to evaluate the types of things you like to do.

d. The code also gives you an idea of the trends you are following in doing enjoyable things.

e. It is a good idea to do this activity at different times in the year to show the students how they might have changed during the year.

f. Declaring the things you enjoy doing provides you with a way of identifying and clarifying what you enjoy.

6. References:

Simon, Sidney; Leland Howe and Howard Kirschenbaum

Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

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*Sample Valuing Questions a and b in #4 have been reprinted by permission of Hart Publishing Company, Inc., from its copyrighted volume VALUES CLARIFICATION: A Handbook of Practical Strategies for Teachers and Students by Sidney B. Simon, Leland W. Howe and Howard Kirschenbaum.

All Grade Levels Glen Erickson

Rank Order

1. Time Involved: 10-20 minutes

2. Materials Needed:

   a. pencil and paper

   b. blackboard

3. Recommended Procedure:

   a. Explain to class that you will be reading some questions to them, which they will rank order according to their own value perspective. Each question will consist of 3 or 4 alternative choices.

   b. Read a question, and write the alternative responses on the board.

   c. Have the students write down their rank orders (1 for first choice, 2 for second choice, etc.) for that question on a piece of paper.

   d. After everyone has completed their rank ordering for the first question, allow several students to share out their rank orders and their reasons with the class.
   e. Continue this same procedure for all the questions you wish to use.

4. Sample Valuing Questions:

   a.* Which would you least like to be?

      1. Deaf
      2. Blind
      3. Paralyzed from waist down

   b. Would you rather be a

      1. Flower
      2. Tree
      3. Boulder

   c.* Where would you rather be on a Saturday afternoon?

      1. At the beach
      2. In the woods
      3. In a discount store

d.* Which is most important in a friendship?

1. Loyalty
2. Generosity
3. Honesty

e.* Where would you rather live?

1. On a farm
2. In the suburbs
3. In an inner city

f. Which is the least important to you?

1. A horse
2. A dog
3. A deer

g. How many children would you like to have?

1. 0
2. 1
3. 3

h.* What would it be hardest for you to be?

1. A prison guard
2. A welfare inspector
3. An assembly line worker

i. What is the most serious problem facing society today?

1. Education
2. Pollution
3. Racism

j. Rank the following environmental problems in order of their critical nature.

1. Energy
2. Air and water pollution
3. Housing

k.* Which pet would you rather have?

1. A cat
2. A dog
3. A parakeet
4. A turtle

l.* If you were President, which would you give the highest priority?

1. Space program

2. Poverty program
3. Defense program

m. Which method of transportation do you like the most?

1. Riding in a car
2. Riding a bicycle
3. Walking
4. Flying on an airplane

n.* Which do you like best?

1. Ice cream
2. Pudding
3. Jello

o.* Which would you like to do most?

1. Learn to skin dive
2. Learn to ride a horse
3. Learn to ride a mini-bike

p. Which do we need to train more of? Each group to be ranked separately.

Group I	Group II
Lawyers	Skilled Labor
Doctors	Professional
Teachers	Management

q. Which would you rather own?

1. A motorcycle
2. A backpack
3. A TV set

r. You are hiring for a sales position in a chain store. You have three applicants. Which one would you choose?

1. An exconvict
2. Unmarried pregnant female
3. A released mental patient

s. The largest industry (employer) in town is destroying the main river. What action?

1. Arson (violent protest)
2. Boycotting
3. Petitioning city hall

t. What is the most influential factor of social change?

1. Family
2. Peer group
3. Governmental laws

u. You witness a mugging. Which action would you take?

1. Direct assistance
2. Call police
3. Ignore

v. Have the class make up own rank orders.

5. Debriefing:

a. Publicly affirming one's values helps in clarifying those values.

b. No order is right or wrong

c. Sharing out students' reasons for their rank orders helps other students clarify their own values by listening to other alternative rankings, along with the students' reasons.

d. Helps students understand that many issues require more careful consideration than we normally give them.

e. Helps demonstrate that to make a decision about an issue requires one to make a choice.

6. Reference:

Simon, Sidney; Leland Howe and Howard Kirschenbaum.

Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

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* The Sample Valuing Questions c,d,e,k,l,o,n and part of a and h have been reprinted by permission of Hart Publishing Company, Inc., from its copyrighted volume VALUES CLARIFICATION: A Handbook of Practical Strategies for Teachers and Students by Sidney B. Simon, Leland W. Howe and Howard Kirschenbaum.

Upper Elementary
Junior High
High School

Glen Erickson

Baker's Dozen

1. Time Involved: 10-15 minutes

2. Materials Needed:

   a. pencil and paper

3. Recommended Procedures:

   a. Have each student list 13 electrical appliances they use at home (lights, TV, radio, etc.).

   b. After everyone has completed their list, have each student cross out 3 things he or she can do without.

   c. Next have the students check 3 things they feel they couldn't do without.

   d. Now, have each student circle the items which they obtained within the last 5 years (3 things which would not have been on their list 5 years ago).

   e. Allow the students to share their lists and reasons with the class (you can pick several students or just ask for volunteers).

4. Sample Valuing Questions:

   a. The class could list 13 records they own, identifying the 3 most important and the 3 least important records.

   b. The class could list 13 items they have purchased or been given (bicycle, watch, new clothes, book, etc.) identifying the 3 items they would be most willing to give up, and the 3 items they would least like to give up.

5. Debriefing:

   a. Identifying one's priorities is necessary when considering among various alternatives.

   b. Many electrical appliances are luxury items, which are seldom used, and are not very important to one's life style. Perhaps these items might not be purchased if a person thought about whether the item was very important, or just another thing to buy.

c. The U.S. has doubled its energy consumption in the last 20-25 years. With only 6% of the world's population, the U.S. consumes 37% of all the energy used in the world. A large portion of this increased energy consumption is due directly to the purchasing (it takes energy to produce an electrical applicance, as well as, energy to use it) and use of non-essential or luxury appliances.

d. Identifying those items obtained within the past 5 years indicates personal trends in purchasing and consuming behaviors.

e. Looking at the items crossed out as non-essential, the students can begin to think how easy it is to stop using those items once they have identified them.

6. **Reference:**

Simon, Sidney; Leland Howe and Howard Kirschenbaum.

Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

Junior High
High School

Glen Erickson

Brand Names

1. Time Involved:

    a. 20-30 minutes class time

    b. 20 minutes homework

2. Materials Needed:

    a. ditto

    b. pencil

3. Recommended Procedures:

    a. Prepare a ditto:

        1. Divide it lengthwise into 2 sections.
        2. Number 1-10 on left margin, and on the top of the left half write: All the Brand Names in Our Bathroom.
        3. Divide the right half into 3 columns:
            (a) Column I, to be used to answer: Who brought the item or article in to the house?
            (b) Column II, to be used to answer: What motivated you or another member of the house to purchase the item?
            (c) Column III, to be used to answer: Was the item selected carefully from among alternatives?

    b. Have the students take the ditto home and record the brand names from the bathroom.

    c. The students should also fill in Columns I and II at home.

    d. After all the students have brought back their completed lists, they can complete Column III by answering its question after referring to the debriefing questions that you place on the board. Column III is for the items purchased or selected by the student.

4. Sample Valuing Questions:

    none

5. **Debriefing:**

   a. Why did you purchase the various brands?

      1. You heard about it from a friend?
      2. Did you choose the item of your own free will?
      3. Did TV or radio influence your choice?
      4. Do you truly believe in the article?
      5. Was the article on sale?
      6. Do you associate any prestige with the brand (over another).
      7. Did your parents use this brand?

   b. Everyone is influenced in some way be advertising, so students shouldn't feel too bad if most of their Column III responses are negative. What is important is what they do once they realize their choices were not made freely by selecting from alternatives.

   c. A fourth column could be added concerning Column III. The students can answer by using the code letters for each statement:

      K I'll keep it or keep buying it.
      E I'll eliminate it or stop buying it.
      C I'll change to another brand name.
      T I'll have to think more about whether I'll keep it, or eliminate it, or change to another brand name.*

6. **Reference:**

   Simon, Sidney; Leland Howe and Howard Kirschenbaum.

   Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

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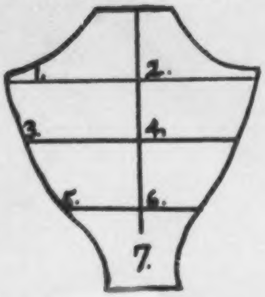
Junior High
High School

Glen Erickson

Coat of Arms

1. **Time Involved:**
    - a. one hour
2. **Materials Needed:**
    - a. pencil and paper, or ditto
    - b. blackboard
3. **Recommended Procedures:**
    - a. Either make a ditto or have students draw their own coat of arms like the following:



- b. The students are to answer the following questions by drawing a picture or design to illustrate their response for each question in the appropriate space.
    1. One value to which you are deeply committed (value from which you would never budge).
    2. How would your life be different if you won $1 million in a lottery?
    3. Your greatest sacrifice for the environment in the last year.
    4. Your material possession of most value.
    5. Your greatest success symbol.
    6. Something you are striving to obtain (material, personality trait, abstract).
    7. One thing you are thankful for.

c. The students can then share their coat of arms with others (if they wish to), or could be displayed. Art work is not important, as long as the student can recognize his own symbol.

4. Sample Valuing Questions:

   a. Draw 3 things you are good at.

   b. What one thing would you want to accomplish by the time you are 65?

   c. What would you do if you had one year to live, and were guaranteed success in whatever you attempted?

   d. What do you admire most in others?

5. Debriefing:

   a. This activity is an enjoyable way of helping students think about some important value questions, such as:

      1. What am I doing with my life?
      2. Am I just reacting to others, or am I in control of the direction of my life?
      3. Is my life making any difference?

   b. Illustrating values with symbols helps a student to clarify and think about his or her values.

6. Reference:

Simon, Sidney; Leland Howe and Howard Kirschenbaum.

Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

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All Grade Levels

Talbert B. Spence

The Pie of Life

1. Time involved: 45 - 50 minutes

2. Materials needed:

   a. Blackboard or chart paper

   b. Worksheets (for Upper Elementary, Junior High, Senior High) with drawing of a large circle to be used in diagraming a "pie of life" (see example in 3g).

3. Recommended procedure:

   a. Explain to students that this activity is designed to have them investigate our individual lives - to see how we actually do spend our time, our money, etc.*

   b. Group class into teams of 4-5 students. Explain that these teams are for the purpose of having individual and group decisions on how our time, money, etc. can be used more efficiently.

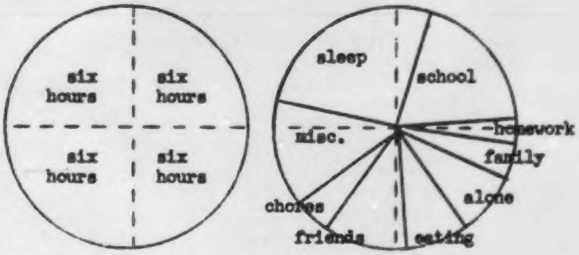
   c. Ground rules: Teacher draws on blackboard/chartpaper or on worksheets a large circle and says, "This circle represents a part of your life".* Explain that the group will be doing several such pies of life.

   d. Have students divide their circles into four quarters using dotted lines. Note: For lower elementary and middle elementary this portion of the activity should be done by the teacher at the blackboard.

   e. Explain that each slice represents six hours. Discuss with groups that they are now going to try to estimate how many hours or parts of an hour are spent on the following:

      (1). On sleep? *
      (2). On school? *
      (3). On eating?
      (4). With friends, socializing, playing sports, etc.? *
      (5). Alone, playing, reading, etc.? *
      (6). On homework? *
      (7). Etc. (Any others you can think of)?

f. Have students divide up the time spent in their individual pies of life. Explain that their allotted times will differ from one another. Have them draw slices in their pies to represent proportionately the part of the day they spend on each category. An example might be:



g. After students have completed individual pies (about 10-15 minutes) have the group work toward a group pie of life with the same categories. Have students take about 10 minutes to do this and then have groups share out their results to the rest of the teams.

h. Discuss the importance of using time wisely and efficiently. Emphasize that a large majority of our time spent in a 24 hour period is wasted time; most by sleeping (a reasonable amount is needed) and by doing nothing.

i. Have students develop a list of ways to use their time, money, etc. more wisely and efficiently.

j. Examples of other categories that could be used in the Pie of Life strategy:

(1). How does society spend its money?

(2). How much time is spent on cleaning up the environment?

(3). How much money is spent on cleaning up the environment?

(4). How much time is spent by people destroying the environment?

(5). How much time is given to students to plan and make decisions?

(6). How do urban children spend their time daily?

4. Debriefing:

   a. It is important that students start to evaluate how their time and money are spent by them and by others. Also to think about and develop ways of better utilization of their time and money, etc.

   b. Might be a way to discuss alternative life styles, also a way to clarify individual and societal values on time and money.

   c. For lower and middle elementary levels, this strategy could be a way of strengthening knowledge and skills of telling time and understanding what it is all about.

5. References:

   a. Simon, Sidney; Leland Howe and Howard Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York: Hart Publishing Co., 1972.

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All Grade Levels

Talbert B. Spence

Either-or Forced Choice

1. Time involved: 45-50 minutes.

2. Materials needed:

   a. Two blackboards or large pieces of paper.
   b. Can also be done with two slide projectors and appropriate slides.

3. Recommended procedure:

   a. Have students arrange their desks/chairs so that there is a wide path from one side of the room to the other.*
   b. Place blackboards on opposite sides of the room.
   c. Place an either-or question on the blackboards; and ask
   Example: Which do you identify with more
      1. The Four Tops
      2. The Jackson Five
   d. Explain to the students that they are to select one of alternatives and move to that side of the room where it is posted.
   e. Have students form triads to explain briefly why they decided on this choice. Allow 2 minutes per student.
   f. After the 2 minute triads session have students return to the center of the room and ask another either-or question.
   g. Select a student from each opposing views and have them relate to the entire group why they made their particular choice.
   h. This exercise has an unlimited range of alternative questions to ask.

4. Sample of Either-or Forced Choice Questions. "Which do you identify with more:"

   a. Asphalt or grass
   b. Clean air or dirty air
   c. Noisy neighborhood or quiet neighborhood
   d. A clean playground or a littered playground.
   e. Love and understanding or hatred and distrust
   f. New housing or old housing.
   g. Equal rights or no rights
   h. Trees or telephone poles
   i. Expressways or bike routes
   j. Urban community or suburban community
   k. Strip mining or solar energy
   l. Nuclear power plants or steam power plants
   m. Urban farming or high prices
   n. Cooperative living or independent living
   o. Have group suggest other Either-or questions.

5. Debriefing

   a. Note the importance of having individual differences and the freedom to evaluate all possible alternatives to an issue or situation.

b. Participants can physically see how their values relate to the values of the group members.

c. No position or alternative is right or wrong.

d. Sharing out reasons for indivdual choice among group members is important in clarifying individual position.

e. Any two contrasting value statements can be used that apply to the group.

6. References:

Simon, Sidney; Leland Howe, and Kirschenbaum. *Values Clarification: A Handbook of Practical Strategies for Teachers and Students*. New York: Hart Publishing Co., 1972.

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* Procedure in #3a has been reprinted by permission of Hart Publishing Company, Inc., from its copyrighted volume VALUES CLARIFICATION: A Handbook of Practical Strategies for Teachers and Students by Sidney B. Simon, Leland W. Howe and Howard Kirschenbaum.

All Grade Levels

Talbert B. Spence

Public Interview

1. Time involved: 5-10 minutes per interview.

2. Materials needed: none.

3. Recommended procedure:

    a. Ask for volunteers who would permit a public interview about some of their personal beliefs, feelings and actions.
    b. Explain ground rules several times as to safeguard the students personal feelings.
        (1) The teacher may ask any question about any aspect of his or her life and values.*
        (2) If student decides to answer question, she or he must answer honestly.
        (3) The student has the option to decline to answer question.
        (4) The student can end the interview at any time by simply saying "Thank you for the interview".*
        (5) At the completion of the interview the student may pose any of the same questions to the teacher that were put to him or her.
    c. Each interview should be brief. About 5-10 minutes, unless there is a demand by everyone to continue.
    d. You may want to invite other members of the class to answer any of the questions the interviewee was asked.
    e. After some practice at public interviewing you may want the students to choose the topic they want to be interviewed about.
    f. Instead of conducting the interview, you may want to select a student to conduct the interview. It is important to debrief student on ground rules before allowing any interviewing.

4. Sample interview questions: Lower and Middle Elementary grades.

    a. Do you get an allowance? What kind? Do you work for it?*
    b. If you could be any age, what age would you like to be?*
    c. Will you be a cigarette smoker? Why?*
    d. What about the world around do you wonder about?
    e. Do you think people should be allowed to live anywhere they want to?
    f. What are your feelings about people of other races and cultures?
    g. Do you like living in the neighborhood you are presently living in? Why?
    h. Would you want to live in an area where the air was unclean? Why or why not?
    i. Do you like flowers and trees? Why?

    Examples for Upper Elementary - Junior High grades.

    a. What are your feelings about poverty?
    b. Do you feel comfortable about living in the city?
    c. What are the major problems facing young people today?

d. What is your opinion on public welfare?
e. Is there anything special about family meals at home?
f. How do you feel about man's exploitation of our valuable natural resources?
g. What are some of the reasons for environmental pollution in this country?

Examples for Senior High school.

a. Should your school provide classes dealing with population education?
b. What are your views about racism and sexism in your school? Home? Neighborhood?
c. Do you feel that large energy corporations should be allowed to strip mine for coal on Indian lands? Why? Why not?
d. Do you feel communities should have control of their tax monies which they contribute yearly to the state and federal governments?
e. How important is it to the survival of space ship earth and its passengers to maintain a clean environment?
f. Are there some adults outside of school whom you admire intensely? Why?
g. What are your feelings about a world with universial peace?
h. What has turned you off to school? Why?
i. What are some ways students can contribute to their own education?

5. Debriefing:

a. Discussion is very important. You can compare and contrast male and female responses.
b. Sharing out reasons for individual positions or values is a good way of developing good interpersonal relationships among group members.

6. References:

Simon, Sidney; Leland Howe, and Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York: Hart Publishing Co., 1972.

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* The Recommended Procedure in 3b (1) and (4) and the Sample Interview Questions in 4a,b,c have been reprinted by permission of Hart Publishing Company, Inc., from its copyrighted volume VALUES CLARIFICATION: A Handbook of Practical Strategies for Teachers and Students by Sidney B. Simon, Leland W. Howe and Howard Kirschenbaum.

Upper Elementary
Junior High
Senior High

Glen Erickson

Agree-Disagree-Undecided

1. Time involved: one class period, 40 - 50 minutes.

2. Materials needed:

   a. ditto
   b. blackboard

3. Recommended procedures:

   a. Prepare a ditto with the following suggested statements dealing with population. Put half the statements on each half of the ditto and cut out each "card" with 1 statement on each.

      1) Population education concepts should be integrated into all the grades and most of the courses taught in primary and secondary school

      2) Human population increases throughout the world are serious. Even with a rate of four births for every two deaths, science and technology cannot provide means for survival (without limiting population growth).

      3) Overpopulation is the basic cause of the environmental crisis.

      4) America's population poses a greater threat to the world ecosystem than India's.

      5) Generally, families should be limited by law to no more than three children.

      6) People should be allowed to have as many children as they want without being told in any way by the government how many they should have.

      7) The government should provide tax and welfare benefits and penalties that would discourage childbearing rather than encourage it, as present systems tend to do.

      8) Due to the controversy connected with "sex" education, it would be self-defeating to link population education with sex education.

   b. Divide the class into groups of 3, 4 or 5 and give each group a set of statement cards.

   c. Have each group decide, as a group, whether their group agrees, disagrees or is undecided for each statement.

d. Have each group sort their cards into stacks for agreeing, disagreeing, or being undecided.

e. After each group has decided on all the statements, tabulate on the board the number of groups agreeing, disagreeing, or being undecided on each statement. Allow about 20 minutes.

f. Discussion of the reasons for different groups' positions can then take place.

4. Sample value questions:

a. Statements concerning a particular issue like housing, pollution costs, or environmental responsibility or ethic.

b. Any statements concerning a particular lessor activity the class is doing.

5. Debriefing:

a. This activity is good to introduce a specific unit, as in the case, population. It helps the class become more sensitive to the unit before doing any encounter or activity.

b. Group decision-making is different from individual decision-making, because a consensus must be reached in a group, with people compromising their positions. All the group members benefit by listening to other member's feelings, and attitudes, which helps the indivudual re-evaluate his or her own position.

Upper Elementary
Junior High
Senior High

Talbert B. Spence

Ways to Live

1. Time involved: 2 sessions of 45 minutes each

2. Materials needed:

    a. Blackboard or worksheets

    b. Chart paper and markers

    c. Pencils

3. Recommended procedure:

    a. Explain to students that this activity will deal with the formulation of their own philosophy of life by responding to a variety of ways to live.

    b. Generate a list of 10 - 13 different life style by asking students to describe a kind of life style they now live, have read about, heard about, seen, or possibly dreamed about. Be sure extreme views are represented.

    c. Expand this list of life styles into philosophy statements by asking questions such as the following:

        (1). In this life style, does the individual person have a say in how his town is run?

        (2). Is money important in this life style? How important?

        (3). Is education important?

        (4). Do people care about other people?

    d. List these life style description statements on the blackboard, on chart paper (or on a ditto for a second session). A sample statement might be (complexity depends on the age group):

    Way 1: The individual actively participates in the political and social life of the community, to be a primary change agent in altering the present political system of his country. In this life, excessive monetary desires are avoided and moderation or a natural living is sought. Life is marked by physical and mental discipline, love, and friendship. Life is to have clarity, balance, intelligibility and respect for cultural differences.*

e. Have students respond to the 10 - 13 Ways to Live statements by ranking each statement from first desire to least desire using the following key:

7 - I like it very much.
6 - I like it quite a lot.
5 - I like it slightly.
4 - I am indifferent to it.
3 - I dislike it slightly.
2 - I dislike it quite a lot.
1 - I dislike it very much.*

Be sure students understand that their ranking does not depend on what kind of life they lead now, or the kind of life they think is unnatural to live in our society, but simply the kind of life that they personally would like to live.

f. After students have completed their ranking, about 10-15 minutes, have students team up with another student and discuss their individual rankings. Allow about 5 minutes for this discussion.

g. Ask volunteers to give their individual rankings and record their responses on the chart paper.

h. Group students into teams of 5-6 individuals. Instruct them that within a 15 minute period they must come up with a group decision on the ranking of the 10 - 13 ways to live. Have each group record their rankings on chart paper.

i. Have students write out their own way of life statement. This should reflect their philosophy of life at this point in their lives.

j. Finally, have students think and list ten things they have done in the last week that that are consistent with their philosophy of life (e) or the way they live described in (i).*

5. Debriefing:

a. Do you think there is any one life style that is right for all people?

b. Are you satisfied with your life style?

c. Did the group find it difficult or easy to agree on ranking?

d. Did the group decide your way? or did you give in to the group?

e. What did you learn about yourself?

f. Add any other observations or questions about the dynamics going on during the group decision-making session.

g. Discussion on alternative life styles is important because the student is exposed to other cultural and noncultural ways of living.

6. References:

a. Simon, Sidney; Leland Howe and Howard Kirschenbaum. *Values Clarification: A Handbook of Pratical Strategies for Teachers and Students*. New York: Hart Publishing Co., 1972.

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Junior High
Senior High

Glen Erickson

Panel

1. Time involved: 20 - 30 minutes

2. Materials needed:

   a. Eight chairs
   b. Blackboard

3. Recommended procedure:

   a. Place 8 chairs in front of the class, facing the class.

   b. Explain that 8 volunteers are needed to sit on a panel and decide where they stand individually on a series of issue questions and to defend their positions before the class.

   c. After 8 volunteers have seated themselves, ask 4 students one question, and the other 4 another question.

   d. After each panel member (4) has stated his or her position allow the class to question the panel member's position.

   e. Continue the same procedure for both Agree-Disagree questions and for continuum questions.

4. Sample valuing questions:

   a. The following are Agree (hand up) or Disagree (Hand down) questions:

      1) Do you enjoy a rural environment more than an urban environment?
      2) Do you feel you can make an impact on political decisions?
      3) Do you feel comfortable or unthreatened?
      4) Do you think a terminal patient should have the option of euthuasia (mercy killing).
      5) Laws banning non-returnable bottles should be declared unconstitutional?

   b. The following questions are continuum questions answered by having each panel member state where his or her position is on a certain issue question. Place the following on the board:

      Almost always / or / Strongly agree
      sometimes -- not usually / agree neutral / or / disagree
      almost never / or / strongly disagree

      1) Do you wear seat belts (almost always, sometimes, etc.).
      2) Do you feel that additional monies earmarked for highway construction and improvement should be directed to mass transit?

3) Do you believe in legalized abortion?
4) How do you feel industrial abatement devices should be financed?

    a) Government paying a large share (place on left of continuum).
    b) Decrease dividend to stockholders (place in middle of continuum).
    c) Increase price of the product (place on right of continuum).

(Second part of 4) One of the big 3 auto manufacturers recently announced record sales for 1972 (12% above 1971 and 2% over previous alltime high). This will result in stockholder receiving largest dividend ever - $7.51 per share.

Does this have any effect on your previous answer?

5) Do you feel that the percentage of state recreation funds to rural areas should be reduced in order to provide more money for urban recreation?

5. **Debriefing:**

a. Publicly affirming and defending one's position before peers helps clarify and strengthen one's values.

b. This activity allows students who don't feel strongly in their own values to listen to other's values and to question them, providing the non-volunteers a way of sorting through their ideas and values.

6. **References:**

Simon, Sidney; Leland Howe and Howard Kirschenbaum. Values Clarification: A Handbook of Practical Strategies for Teachers and Students. New York, Hart Publishing Co., 1972.

SECTION V

ENVIRONMENTAL ENCOUNTERS

SECTION V

Environmental Encounters

This section contains a series of sample school-community environmental problem solving activities (Environmental Encounters). In these environmental encounters students (with guidance from the teachers) actively become involved in exploring and critically evaluating their environment and existing environmental problems. The students may then begin to develop alternatives and plans of action for solving environmental problems. As students become actively involved in environmental problem solving they gain the opportunity to acquire both knowledge and skills necessary to deal with current and future environmental problems.

Included are sample environmental encounters relating to all grade levels and disciplines starting with early elementary encounters, which concentrate mainly on developing a basic awareness and appreciation for the environment, and ending with senior high encounters, in which students may actually become involved in the political process in trying to implement the designed plans of environmental action.

You may find it helpful to adapt some of the sample encounters for use in your particular classes. However, you will probably find that the "best" environmental encounters are ones jointly developed with your students around their environmental interest and concerns.

Environmental encounters are arranged by topics as listed below:

1. Air Pollution
2. Ecology and Pesticides
3. Policy and Planning (soils, land use, planning, and environmental law)
4. Recreation

5. School Site Development
6. Transportation
7. Water Quality

Within each topic section the encounters are arranged by grade level from lower elementary to high school.

The encounters represent a wide diversity, so that some are applicable to inner city, and some to suburban and rural situations.

The following are guidelines to be considered by the teacher in assisting students in the selection of a community issue to be studied:

a. An issue should be selected as a result of a student-teacher interaction--a cooperative venture.

b. An issue should be current and important to the class.

c. A suitable issue should consider students' background, ability, and maturity.

d. An issue should not be too complex for the class to comprehend.

e. An issue should include resource material appropriate to the abilities of the class and covering the various issue perspectives.

f. An issue for which there is adequate time to study and to work toward the solution.

g. An issue that the teacher is prepared to handle.

h. An issue that the school principal, local P.T.O., and central administration would support as being appropriate for class study and action (an environmental education program should establish effective communication lines between the environmental education staff and the school administrators, teachers, parents, and the community at large.

i. The issue should be selected only after considering items such as student interest in the project, student and community priorities, available resources, funding, risks involved (personal, class, school, etc.), school board policies, and the social implications of the work you are planning in that community.

Lower Elementary

Dolores Furesz

INVESTIGATING AIR POLLUTION IN THE COMMUNITY

BEHAVIORAL OBJECTIVES:

At the completion of this encounter, the student should be able to:

1. Explain what is meant by the term "air pollution."
2. Identify (number) major causes of air pollution in the community.
3. List (number) ways that air pollution is harmful to man and to other living things.
4. List (number) ways that air pollution can damage non-living things.
5. List (number) ways one can find out if the air in the community is polluted.
6. Describe (number) ways that people are trying to lessen the air pollution problem.
7. Design and assemble in booklet form the information gathered on air pollution.
8. Distribute this booklet to inform parents on the problems and possible solutions of air pollution.

ACTIVITIES:

1. Go outside and look at the sky. Is it clean and bright-looking? If not, what do you think is in the air? (particles, smoke, ordors, termed "pollution") Why is pollution undesirable? (It is harmful to man's health and property).
    a. What ways can air be polluted "naturally", without man's help? (dust storms, forest fires, volcanic eruptions, rotting plants and animal bodies).
    b. How can man pollute the air? (factory smoke, car and truck exhausts, burning leaves and trash, heating homes, using fireplaces).
2. View the filmstrip on air pollution in the "Environmental Crisis" * series in your research center. Do you see any problems there that are in your own community? Which ones?

* Environmental Pollution: Our World In Crisis - set of six - Ward Natural Science Establishement, Inc., Rochester, New York.

3. Take a bus ride through the community. What do you see that can be a cause of air pollution? (smoke from chimneys of factories, businesses, private homes, exhaust from cars and trucks, open burning, dust blowing from open land areas).

4. Interview your parents and neighbors about air pollution. What do they say causes air pollution? How do they think it hurts us?

5. Discuss why people don't like air pollution. Why do we worry about what is in the air? How can it hurt us? How can it hurt other living things? Can it hurt other things too? (non-living)

6. Invite an air pollution specialist or school nurse to talk about air pollution and its effect on a person's health. Ask questions about things that worry you or your parents or your neighbors.

7. From what you have heard and from your discussions, make a list of all the ways that air pollution can hurt man. (damage lungs, cause coughing, eyes to water, headaches, vomiting, nausea, fatigue)

8. Read and discuss ways that air pollution affects our property. Refer to the filmstrip mentioned earlier. (#2) How does it affect living things on our property? (affects process of food making in flowers, trees and grass; makes plants turn yellow; retards growth; kills the plant). How does air pollution affect other things in your property? (affects color of buildings, dissolves marble, pits metal, corrodes steel, discolors paint).

9. How can you find out if the air in the community is polluted? (Ask County Health Department) Find out about some experiments you can do.

   a. Place two cake pans on the school roof. Smear petroleum jelly on one, and place white drawing paper in the bottom of the other. Remove from roof the next day. Do you see anything stuck to the petroleum jelly? Do you see anything on the white paper? What do you think it is? (dust, soot)

   b. In winter set a pan on the roof to catch snow. Melt the snow. What do you find in the water? How did it get there?

10. Perform some experiments that demonstrate other forms of air pollution.

    a. Light a candle. Hold a metal spoon over the candle. What collects on the spoon? (carbon) Can you name some sources of carbon pollution in your community?

Blow out the candle. What is going in the air now? (smoke) Can you name some sources of this form of pollution in your community?

b. Show a dirty furnace filter and a used bag from a vacuum cleaner to illustrate the dust particles found in household air.

11. Refer to filmstrip again. Name some ways that the air pollution problem can be diminished.

    a. Some cities have passed laws so people cannot burn trash, garbage or leaves.
    b. Engineers are working to make cars, buses, planes and trains send less fumes into the air.
    c. Some factories are installing pollution control devices so less pollutants go into the air.

    d. Some people are using their cars less, and walking or riding bikes when they do not have far to go.

12. Using what you have learned about air pollution, construct a booklet that illustrates:

    a. The major sources of air pollution in your community.
    b. How pollution hurts man and his property.
    c. How we can help diminish pollution problems in the air. This booklet can be made from chart story paper. Pictures of problems could be placed in it with a story about each picture.

13. Send a booklet home to each family in the school.

Lower Elementary

Loraine Turcotte

INVESTIGATING AIR POLLUTION

BEHAVIORAL OBJECTIVES:

At the completion of this encounter, the student should be able to:

1. Identify air as a physical substance.
2. Demonstrate its presence by its effects.
3. Demonstrate that air contains many impurities.
4. Identify through senses (number) uses of air.
5. Identify through ones senses (number) pollutants in the air.
6. List (number) air pollution problems.

ACTIVITIES:

1. General class discussion concerning the three basic components of the environment: When you go swimming what do you swim in? What do you splash on one another? What do you plant seeds in? What do you put in a sandbox besides toys? What makes your kites fly?

2. Can you smell, see, feel air? How do we know it is around us? Look outside and see if you can see evidence of the presence of air. Are leaves moving? Are the trees swaying back and forth? Is dust being blown around the playgrounds?

3. Find a piece of furniture or some other article in the room that is dusty. Where did the dust come from? Put on the movie projector - turn out the light - what do you see in the ray of light? How many of you have ever had something in your eye? How did it get there? How many of you have ever seen dust on plant leaves? Where did it come from?

4. Take students outside and collect leaves from different areas and show by comparison of leaves the degree of dust that had settled on each leaf. Collect some leaves from inside a forest or sheltered area from a field or hedgerow from along side a road. Which leaves are dirtier? Why? Would leaves from trees in a city be dirty? Does this dust hurt the leaf? How?

5. Try using ones senses to identify air and its impurities. How many senses will help you determine healthy or unhealthy air? Can you see dirty air? Can you smell dirty air? Can air be dirty even if you can't detect it?

6. A game could be played where a student is blind folded and one passes under his nose various pleasant and unpleasant smells -- emphasize or point out that through our senses we can detect the good and bad part of many things. Also through our senses we can detect many things in air. Have you ever smelled a rotten egg? Can you smell a barnyard? Can you smell popcorn? Can you hear water running? Can you hear a dog bark? Do you hear sirens sometimes at night? Can you hear a city? Traffic? Is it loud? Is there too much noise? Could this mean air in someplaces has too much noise? Is it as noisy in the country? Could air then be filled with more noise in one area than another? Could noise like dust be in air?

7. Could there be a way to remedy some of these air problems that have been identified such as dust? noise? What are they? Do we have such problems in school? Should we talk to the principal about them?

Middle Elementary

Emily Klopfenstein

A STUDY OF AIR POLLUTION CAUSED BY AUTOMOBILES

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter the student should be able to:

1. Identify (number) effects of air pollution.
2. List (number) reasons why the automobile is the greatest cause of air pollution.
3. Gather a sample of auto air pollutants from a car tailpipe.
4. Name (number) ways the automotive air pollution problem can be eased.
5. Plan a campaign to combat automobile air pollution.
6. Carry out the campaign.

ACTIVITIES:

1. List on a chart air pollution problems. Which directly affect man? Which affect non-living things? What are the sources of air pollution?
2. Is the internal combustion engine efficient in burning its fuel? What is the most widely used form of transportation today? Has there been much control on the automobile concerning its use and upkeep?
3. Have each student perform an experiment with their family car. Each student should cover the tailpipe with gauze for one day and bring in the cloth. Describe the cloth. What is the blackish color due to? Survey the class and divide it into groups whose family car was driven 1-5 miles, 5-12 miles, 12-20 miles, and over 20 miles in one day. Which group has the darkest cloth? Is there anyone in the first group with a dark cloth? What might this tell you about their car? What is the dangerous colorless, odorless gas the automobile is known to emit? Does exhaust have a pleasant smell?
4. Seek information on the use of lead free gas. How would the efficient use of diesel fuel in a diesel engine ease pollution? Seek information on the turbine engine. Will it be necessary to revert to the electric or steam vehicle? Why were these engines abandoned? Seek information on automobile air pollution control devices. Discuss how they recycle the exhaust for more efficient burning. How can the individual help ease the problem? Can we hike or bicycle more? Should we let the cars'

engine idle while it's standing? Can we drive more efficiently avoiding rapid acceleration and braking (which causes attrition pollution)? How would keeping the car in good repair and tuned up aid in pollution control? Can we arrange to share rides? Why should we support mass transit? What legislation is needed for industry to install the best pollution control devices and manufacture cars which won't break down when the car is new. What aid is needed for research in this area? What legislation is needed to force citizens to keep their car in good repair? What aid is needed for research on the use of other fuels?

5. Which problems could be listed on a survey for each student to conduct with his family? List the questions to see if one's family proctices good habits to help ease air pollution from their automobiles. Does your car have a pollution control device? Does your family hike or bicycle when possible? Do you let the car's engine idle while it's standing? Do you arrange sharing rides when possible? Do you use mass transit when possible? Do you keep up an interest in what legislation is needed?

6. Make a poster presentation of automotive air pollution problems. Put one problem on each poster and display them in school, community, etc.

7. Carry out an automobile anti-pollution campaign through posters and a survey of neighborhood to assess car upkeep, etc. Correct any negative answers within the family. One could expand survey to the community with help from other classes and suggest how one could correct their contributions to air pollution. Check with the State Police to see if it would be possible to conduct the survey with their auto safety check when it's carried out locally. Also, ask to display the posters at this time.

Middle Elementary Dorothy Cox

AN INVESTIGATION OF COMMUNITY AIR POLLUTION

BEHAVIORAL OBJECTIVES:

At the conclusion of a successful encounter, the student should be able to:

1. List in writing (number) sources of air pollution at your school.
2. List in writing (number) sources of air pollution in your community.
3. Describe in writing (number) problems air pollution in your community can cause.
4. Describe in writing (number) solutions for one problem noted in #3.
5. Describe (number) ways you can help to reduce air pollution in your community.
6. List the steps for building and maintaining a compost heap.

ACTIVITIES:

1. Investigate sources of air pollution in the school building. Is there excessive use of chalk and chalk dust in the classroom? How does this affect people? Use vaseline coated paper or vaseline in cups to collect dust in the room.
2. Investigate parking lot, for another source of air pollution. Count cars. Fasten a clean white cloth over exhaust pipe of a car and run motor for (number) minutes. Remove cloth and note residue and color. What about gases that cannot be seen? When a car is allowed to run while standing still, does it add unnecessary pollution? What can we do to remind adults of good habits?
3. Visit the school incinerator after lunch. What is being burned? Does it burn completely? Note smoke and particulate matter coming from chimney. What color is the smoke? Is this desirable? What harm can it do to people? plants? Do you think this is a problem at our school? Would it be a problem with twice as many students?
4. What alternatives are there to burning trash? Who would make the decision? Interview Principal. Are there any alternatives considered?

5. Survey class members to determine:

   a. What kind of heat is used at your house? coal? oil? gas?

   b. Do you burn trash?

   c. Do you have a compost heap?

   d. Do you save paper for recycling?

   e. Did you burn leaves last fall?

   Tabulate and discuss frequency of good environmental practices.

6. Set up a sample compost heap in an aquarium tank using:

   (dead weeds, grasses, and leaves
   4"..... {discarded food from lunch room
   lime
   top soil
   Saran for cover
   1"..... meat thermometer to record internal temperature

   (See attached resource paper "Compost to Fight Air Pollution")
   Observe temperature variance and changes taking place over a period of time.

7. What can class members do to reduce air pollution at our school and at home? Discuss plan of action and implement.

   (Suggestions:

   a. a school compost heap

   b. posters

   c. inform parents via school newspaper article and/or information sheet.)

Upper Elementary

Irene Muirhead

INVESTIGATION OF THE ENFORCEMENT OF THE TOWNSHIP ORDINANCE ON OPEN BURNING

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. State the contents of the open burning ordinance for the local township.
2. Identify who is responsible for enforcing this ordinance.
3. Identify authority to be consulted if local ordinance is not enforced by local official.
4. Describe (number) instances in the community where the ordinance is violated.
5. Describe in writing a plan for informing the public of the ordinance.
6. Develop a plan for reducing open burning in the community.

ACTIVITIES:

1. A visit by someone representing the local fire department. Ask him: What types of burning are restricted? Back yard barrels? leaves? trash piles? barbeque grills? grass, etc.? Why is this law necessary? Are there other reasons why this law should be necessary? What should be done if you know an offender? What happens to someone if they violate this ordinance? Has this been proven effective?
2. Whose job is it to enforce this ordinance locally and county wide? Is it strictly or liberally enforced?
3. Using information gotten from the fire official's presentation, make a general survey of the neighborhood. Record different types of abuse you see within one week in and around the community.
4. Evaluate the survey in class discussion. How many kinds of offenses were observed? Which was the most common? From your observation, do you think the public is aware of the open burning ordinance? If not what do you suggest? Could your local paper be of service? Can you suggest another really effective way to inform the public?

5. Write (as individuals or as a class) to the editor of the local newspaper expressing your survey findings and concerns about the communities awareness of the open burning ordinance.

6. Summarize in writing just how effective the ordinance is. Is it working as it should be? If you are dissatisfied what can you do? What would you suggest to make the ordinance more effective?

7. Develop a plan as a class to reduce the open burning in your community.

8. Carry out the plan.

Upper Elementary

Wilma Forry

INVESTIGATING THE AUTOMOBILE AND ITS EFFECT ON THE AIR WE BREATHE

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Identify in writing the (number) main components of clean air.
2. Describe in writing the respiratory tract which is affected by the quality of air which a person breathes.
3. List in writing (number) health problems which medical research as linked to automobile exhaust emissions.
4. Identify in writing (number) automobile exhaust emissions that are harmful to our health.
5. Name in writing (number) automobile exhaust emissions you feel are most harmful and describe the affect of each on human health.
6. Identify in writing (number) ways the federal government has attempted to control air pollution caused by automobiles.
7. Identify in writing (number) ways our state government has attempted to control air pollution caused by automobiles.
8. Describe in writing (number) improvements the automobile industry has made that were not required by law.
9. List in writing (number) ways the public might influence automobile manufacturers to do more towards pollution control.
10. Develop a plan of action to reduce the amount of air pollution caused by automobiles.

ACTIVITIES:

1. Research information to make a circle graph showing what makes up the clean air of the atmosphere before man adds pollutants.
    a. What gas takes up the greatest percentage of space?
    b. How much oxygen is there?
    c. What are the trace gases?
    d. What are other substances?
    e. How wide is the band around the earth that holds these gases?
    f. Can any of these gases go beyond this into space?

2. Use a chart of the human respiratory system to start discussion on this topic.
    - a. What is the path of air after it enters the nose?
    - b. How does oxygen get into the blood?
    - c. How much air is taken into the lungs?
    - d. How much surface is covered by all the branches of the lungs?

3. Invite a guest speaker from the county health department.
    - a. What are some harmful exhaust pollutants from automobiles that affect human health?
    - b. What are these harmful effects?
    - c. Which do you feel are the most harmful?

4. Interview a resource person from the automobile industry.
    - a. What federal regulations must the automobile industry follow in controlling automobile pollution?
    - b. What are the state regulations for controlling automobile pollution?
    - c. What improvements beyond these has the industry made?
    - d. What are some possible future plans for improvement?
    - e. What possibility would there be in using the gas-turbine engine? Are there other alternative types of engines?
    - f. What would that cost the industry and what would it cost the public to switch from the present type of engine?

5. Make a fact sheet of important information gathered.
    - a. How are automobile exhaust emissions harmful to people?
    - b. What evidence is there that people have been harmed?
    - c. What are the laws controlling this kind of air pollution?
    - d. Has the automobile industry done all it can?
    - e. What can the citizen do about this air pollution problem?

6. Make a plan for reducing the pollution from automobiles.
    - a. How could you inform people about the problem?
    - b. What can the citizen do about laws?
    - c. What can the citizen do about purchasing automobiles?
    - d. What can he do about the operation of his present auto?
    - e. Are there other individual citizen actions possible?

7. Incorporate this information from #6 into a plan which can be used to inform others and themselves about what can be done to reduce harmful auto emissions.

Junior High
Science

William Veegaete

INVESTIGATING AIR POLLUTION

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Identify an air pollution problem within the local area.
2. Identify the importance of firm or factory causing pollution to the area.
3. Define the major types of air pollution.
4. List (number) effects of air pollution on living organisms.
5. List some of the laws which have been recently passed in an effort to control air pollution.
6. Identify the law enforcement agencies that enforce these laws.

ACTIVITIES: Investigating a local factory:

1. Find a plant, factory or shop in the area that is emitting some type of air pollution.
2. What is the function of the plant? What is their product? What are the processes used to produce that product?
3. Classify the type of air pollution. Is it a result of particle emissions, gas emissions, or both?
4. To get an idea of how much pollution is given off in a way of particular matter perform this simple experiment: Get (number) large plates. Cover one side of the plates with a greasy or sticky substance such as vaseline. Set one of these plates near the point of pollution with another plate a little further away and so on. Come back after a period of time (depending on the amount of pollution) and observe the particulates that have settled on the plates.
5. What effect do you think these particulates would have on living organisms? So to the library and try to find some more information on this subject.
6. Considering the production process used by the plant, what types of chemical gases might also be given off as a source of air pollution? What effect do you think these gases have on the surrounding environment?
7. Set up (number) terrariums in the back of the room. Place an open beaker which has been filled with the same chemical that is used in the factory in the terrarium. Place a couple of light bulbs against the sides of the terrarium. This will provide a source of light for the

7. (continued)
   plants and will also raise the temperature in the terrarium which will speed up evaporation of the chemical. Make sure the top of the terrarium is covered (you may want to vaporize the chemical in a flask and pipe the chemical vapor into the terrarium). If you suspect tow or more chemicals are given off by the factory you can test the others in the same way or you may want to combine a couple of the vapors to find out if this has a different effect on the plants.

8. What effect, if any, did the vapors seem to have on the plants?

9. Do you think some type of pollution control should be placed on that factory or shop? Which of the political structures would handle this? How could you bring it to their attention?

10. Develop a plan of action and execute it.

Junior High
Social Studies

Paul Koenig

INVESTIGATING A LOCAL SOURCE OF POLLUTION

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter a student should be able to:

1. Identify what type of fuel is used to furnish power for the generators of a local power plant.
2. Identify what type of pollution is present.
3. List three things adversely affected by the air discharge from the power plant.
4. Determine an alternative fuel that could be used.
5. Compare the cost of the regular and alternate fuel.
6. Describe in writing two benefits that would result from the use of an alternate fuel.
7. List the standards for clean air in this area.
8. Identify the type of equipment used by the plant to diminish air pollution.
9. Develop a plan of action to reduce the amount of pollution created by this power plant.

ACTIVITIES:

1. Visit a local electric generating plant using fossil fuel. What type of fuel is being used for a power source? Why is this fuel used in preference to other types?
2. Inspect the discharge from smoke stacks or obtain information from the proper authority.
3. Determine the degree of "fall-out" by distributing vasoline-smeared plates in the vicinity of the plant.
4. Based on observation determine the effect of pollutants on (a) vegetation, (b) paint and homes, (c) lung disease rates, (d) visability.
5. Investigate to find out the cost per unit of other available fuels. Will the use of other fuels result in less contamination?
6. Correspond with authorities to determine what standards have been established for clean air. Are regulations being ignored and why?

7. Interview the company engineer to find what type of abatement device is used for smoke control. Is this type adequate for the emissions and work load?

8. Research various air pollution abatement devices and their effectiveness. Present two more affective alternatives for abatement (if needed) to the power plant and the regulatory agency.

9. Develop a plan of action to help the power plant aquire a more adequate abatement device if one proves needed. Carry out the plan.

High School
Art or Biology

Jo Burgess

AIR POLLUTION IN YOUR COMMUNITY

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Identify (number) sources of air pollution in the community.
2. Identify (number) resources at the local, state and national level, capable of providing factural and accurate information on air pollution.
3. Illustrate (number) ways local pollution sources contribute to air pollution.
4. Illustrate (number) types of pollutants found in the local air supply.
5. Illustrate (number) ways these pollutants affect the community.
6. Describe, in writing, what local industries and organizations are doing to control their air pollution.
7. Identify the power structure in the community as it relates to air pollution.
8. Determine the appropriate individuals or committees responsible for enforcing air pollution control in the community.
9. Identify the local laws governing the control of pollution.
10. Describe, in writing, what is being done to enforce the existing pollution control laws.
11. Describe, in writing, the future plans for improving the control of air pollution in the community.
12. Develop a plan of action for informing the local citizens concerning air pollution in the community.

ACTIVITIES:

1. Plan a field trip in your community to determine the sources of air pollution. Consider the following in your plans:
    - a. areas to visit
    - b. signs of pollution to look for
    - c. visible effects of pollution
    - d. others
2. Design a check list that will help you thoroughly investigate your community. Example:

2. (continued)

   a. SIGNS OF POLLUTION
      - smoke
      - odors
      - others

   b. SOURCES OF POLLUTION
      - industry
      - open burning
      - electric power plants
      - autos, trucks
      - others

   c. VISIBLE EFFECTS OF POLLUTION
      - discoloration
        - vegetation
        - building stone
        - building paint, esp. white
        - others

      - deterioration
        - building stone
        - statues
        - others
      - dying or dead vegetation
      - particulate matter in the air

   d. OTHERS

3. Use the check list on your field trip as a means of investigating pollution in your community.

4. On a map of your community, pin point the areas and sources of air pollution. (This map could be used as a part of a display on pollution in the community.)

5. Identify appropriate individuals and organizations at the local, state and national level that will be able to provide you with a variety of materials on air pollution. Example:
   a. Doctors
   b. Health Department
   c. Lung Association
   d. Others

6. Interview appropriate resource people at the local level to help you obtain accurate information concerning your own community. Discuss:
   a. Ways local sources of pollution contribute to air pollution.
   b. Types of pollutants found in the local air supply.
   c. Effects of these pollutants on the community.

7. Design "eye catching" posters that illustrate:
   a. Ways local pollution sources contribute to air pollution.
   b. Types of pollutants found in the local air supply.
   c. Effects of these pollutants on the community.

8. Visit local industries and other organizations in the community who are polluting the air and find out what they are doing to control their pollution. (Make them aware this information will be shared with the community.)

9. Identify the power structure in your community and determine the appropriate individuals or committees responsible for enforcing air pollution control in the area.

10. Interview these individuals and committees to find out what is being done to control local air pollution. Inquire about:
    a. What air pollution control laws exist
    b. How these laws are being informed
    c. What the fine is for breaking the laws
    d. What future plans are being considered for controlling local air pollution

11. Using all the information you have obtained, design an air pollution display that will inform your community concerning:
    a. Local sources of air pollution (Map)
    b. How these sources contribute to air pollution (Posters)
    c. Types of pollutants found in the local air supply (Posters)
    d. Effects of these pollutants on the community (Posters)
    e. Existing local air pollution control laws
    f. What is being done to control local air pollution
        by industries
        by others
    g. Future plans concerning local air pollution control
    h. What individuals can do to help control air pollution make a hand-out sheet of suggestions

12. Develop a plan of action for bringing this display to the communities' attention. Consider taking your display to:
    a. PTO Meetings (individual schools)
    b. Local community meetings
    c. School Assemblies (individual schools)
    d. Shopping centers
    e. Others.

Lower Elementary

Dolores Foresz

INVESTIGATING HABITAT ON THE SCHOOL SITE (OR A LOT NEAR THE SCHOOL)

BEHAVIORAL OBJECTIVE:

At the completion of this encounter, the student should be able to:

1. Describe the concept of habitat.
2. Identify the types of habitat found around the school site.
3. Explain why and how the habitat is always changing.
4. List (number) natural or man made forces that might alter habitat.
5. Identify (number) ways that man has managed habitat areas to help wildlife.
6. List (number) possible habitat improvements for certain animals on the school site.
7. Design a habitat improvement project for a specific species.
8. Carry out the habitat improvement project.

ACTIVITIES:

1. Informal oral pretest - what do you think all animals need to live? What are the specific needs of a racoon, deer, chipmunk?
2. Orientation to the meaning of habitat. (The total of all environmental factors - food, water, cover and protection - that must be present for a given animal to survive and reproduce). This might be done through class discussion, film strip, movie, etc.
3. Walk around the school site. What types of general habitats do you see? (Fields, wetlands, woods) What animals could live in these habitats?
4. Walk through a field community and examine it more closely.
   a. What types of animals could live here? (Rabbit, moles, pheasants, field mice) What are their habitats? Why do you think so?
   b. How do you know for sure which of these animals really live in your particular field habitat? (By actually seeing them, finding their homes, studying tracks and droppings, live trapping). Examine the area for nests and tracks.
   c. Use a live trap from the research center or have the students make one. Set it up in the field. See if any field residents are caught. If so, note the animal and release, as live trapping should be used to identify the animals that reside in an area, and not for bringing the animals into the classroom.

   d. Read to students about the life habits and needs of these field animals. In what ways do all these animals need the same things? How do they differ?

5. Examine the wetland habitat. What kinds of animals might live here? (Crayfish, red-winged blackbirds, snakes, toads)

   a. Check the area for tracks and homes. (Crayfish holes are especially easy to find.)

   b. Set a live trap. Examine the contents and release.

   c. Read about these animals. What things do they need that are the same? How are they different?

6. If no woodland habitat is available on the school site or nearby lot, look at a filmstrip or film on animals of the woodland.

   a. What types of animals might live here? (Squirrels, chipmunks, woodpeckers, racoons, snakes.) How can we find out what animals actually live in a particular woods?

   b. Look at filmstrips and read stories about these animals. In what ways are they the same, and in what ways are they different?

7. Discuss the idea that some animals have a large habitat encompassing more than one community. Can you name some of these animals? How do they use different parts of this habitat? (One part for shelter and another one for seeking food.)

8. Make a large mural depicting three habitats of three animals. Include one that might live in more than one community. Outline those animals that you have determined are actual residents of your particular site. Do you see any pattern between all the animals that exist on your site? (Perhaps they all adopt readily to living in close contact with man.).

9. Arrange an exhibit showing the physical evidences of the presence of these animals (track imprints, homes, pictures taken of these animals) on the school site.

10. Discuss the permanency of their residence in the habitat. Will they always be there? Why not? (Habitat is always changing, either naturally or by man's alterations.)

11. Look at filmstrips or slides that show how habitat changes naturally (process of natural succession in plant growth, fire, disease, insect blight, storm damage.)

12. Identify the ways man can alter the habitat (bulldozing, use of pesticides and herbicides, air, water and noise pollution, logging.)

13. Draw a series of pictures that illustrate the different ways that habitat can change.

14. Identify some ways that man alters the natural succession of habitat to help animals. (Maintaining sub-climax forests for deer browse, shrub areas for rabbit and pheasant cover, burring over areas of jack

pine forests to reestablish these same types of forests as a habitat for the Kirkland's Warbler.)

15. Reexamine the animals living in each community. Can some animal's habitat be improved by man? Why would you want to do this? How would you do this? (Set up brush piles for rabbits, and berry bushes for pheasants, blue jays and cardinals, plant shrubs between the field and the woodland community to create edge effect, which attracts more animals.) Will the increase of one animal species adversely affect the other animals living there?

16. Invite a game biologist to make suggestions on habitat improvement. Consider the problem that you will affect the entire ecosystem of that community by encouraging the growth of one species.

17. Outline a project for habitat improvement that will encourage the growth or protection of one species. Describe the method you will follow to carry out this project.

18. Implement the outlined project in activity #17. This could be done either on school grounds or elsewhere in community.

19. Design a method to evaluate how effectively the habitat improvement is working. Do you see more of these animals in the area? What are some other ways you can tell if these animals are more abundant? Do you see any adverse effects on other members of that community?

Lower Elementary Dorothy Cox

ANIMAL LIFE IN WINTER

BEHAVIORAL OBJECTIVES:

Upon completion of a successful encounter, the student should be able to:

1. Describe (number) kinds of ways animals spend the winter.
2. Draw a picture of (number) kinds of winter homes for animals.
3. Draw a picture of (number) kinds of food available for animal life in winter.
4. Describe (number) ways the class can help provide food for animal life in winter.

ACTIVITY:

1. Visit a nearby field. Observe and open a goldenrod gall. What do you see inside? Do you think it is an insect egg, larva, or adult? Does it need food in winter? Does it provide food for something else?
2. Point out and investigate kinds and amounts of weed seeds in the field. Who would eat these seeds? How do you help seeds travel? How does this help provide more food?
3. Point out and investigate kinds and amounts of berries on hedgerow shrubs. Who would eat berries? How do berry seeds travel? How does this help provide more food?
4. Point out and investigate bud ends of shrubs. Any evidence that twig ends are bitten off? Who would like to eat these? Look for tracks.
5. Watch for cocoons in hedgerow. If any are found, take one inside to be kept for spring emergence.
6. In woods community look for evidences of wildlife at base of trees and shrubs. Look for evidences of animals such as pieces of nut shells, bits of fur, tracks, small openings to ground burrows.
7. Investigate rotted log between bark and wood for insect life.
8. Take sample of leaves and forest floor litter back to classroom for careful investigation of possible insect life. Use micro-projector.
9. Discuss with class ways of helping to provide food and cover for wildlife in their own yards and school yards. Choose at least one to develop with class.

Lower Elementary

Dorothy Cox

AN INVESTIGATION OF PLANT GROWTH NEEDS

BEHAVIORAL OBJECTIVES:

At the conclusion of a successful encounter, the student should be able to:

1. Describe (number) ways a plant can get the water it needs.
2. Describe the kind of soil that provides good food for a plant.
3. Draw a picture of what plants look like when they have no light.
4. Describe orally (number) ways you can help plants so that they have the proper environment for growth.

ACTIVITIES:

Upon completion of Unit 9, "Living Things Grow," Concepts in Science, Grade 1, Harcourt, Brace and World, the students will:

1. Investigate outdoors the growth of a variety of plants including grass, weeds, headgegrow shrubs, trees. Do these plants have a supply of water? Where does it come from? Dig down with shovel in open area to observe moisture in soil. Have children feel soil.
2. Do these plants have a food supply? Use shovel to observe top soil in field area. Note color, texture, moisture. Is it light or dark? Is it crumbly, packed, or grainy? Is it damp or dry?
3. Observe soil in playground area where nothing grows. Note color, texture, and moisture. Why do you suppose nothing grows here? Would a plant have light? Would it have water? Do you think it would have good food? Would the feet of many children help keep plants out?
4. Do these plants in the field have light? Turn over an object that blocks out light (rock, board, rotted log or branch, litter, etc) to note color, shape, and size of sprouts underneath. What happens when a plant does not get light? Do you think these plants will grow very long? Do you think they will ever look like the plants nearby that have light?
5. Observe parking lot and building. Do you think any plants can grow in the soil under the blacktop? Could they get any light or water? What would happen if we built so many buildings and parking lots and paved all the streets so that there was very little open space left? Is this a good idea?
6. What can you do to help plants grow? Can you water them when they need water? Can you pick up litter and boards that keep grass from growing properly? Can you think of any other ways you can help?

Middle Elementary Dorothy Cox

NATURAL HABITATS IN OUR COMMUNITY

BEHAVIORAL OBJECTIVES:

At the conclusion of a successful encounter, the student should be able to:

1. List (number) different types of habitats within walking distance of your school.
2. Draw a picture of (number) living things that live in one habitat listed in #1.
3. Draw a picture of (number) food chains (or web) in the habitat chosen in #2.
4. Describe orally (number) ways people can change each habitat you listed.

ACTIVITY:

1. Visit playground of the school. On a grassy area, mark off with string (number) plots one yard square. Choose sites in sun and sites in shade if possible. Teams of students will observe:
    a. How many different kinds of plants?
    b. How many different kinds of insects?
    c. Any evidence of animal life?
    d. Is ground moist or dry? In sun or shade?
    e. Record above data, collect sample specimens, or sketch specimen types.
2. Visit nearby field area (vacant lot, etc. where no mowing occurs). Repeat procedure outlined in #1.
3. Visit nearby wooded area. Repeat procedure outlines in #1.
4. Visit a nearby swampy area. Repeat procedure outlined in #1.
5. Visit a nearby pond or stream. Mark off sections of bank one yard long. Collect data as outlined in #1. Collect sample of water and stream bottom "gunk." Alter density of sample water by adding salt or sugar. When animal life floats to top, count varieties.
6. Upon return to class room with data and specimens, discuss similarities and differences. Work out a food chain (or web) for each area studied. Organize data and specimens into displays and/or dioramas. (Have Field Guide resource books available for those students who wish to look up specific names of specimens.)

7. Discuss "people" activities that would disrupt each habitat. What would happen to plant and animal life:

    a. If someone decided to put in swings on the part of the playground where you were making your observations?

    b. If the field became a part of the playground and was regularly mowed?

    c. If, in the woods, someone decided to cut down trees, clear out bushes, and build a house?

    d. If someone decided to put the stream or river underground so they could build a road or level a yard?

    f. (Elicit other possible, typical disruptions from students.)

8. Discuss: Should people investigate more than one place or one way to conduct their activities? Should people think of nature too?

Worksheet — NATURAL HABITATS IN OUR COMMUNITY

	PLAYGROUND	FIELD	WOODS	SWAMP	STREAM
PLANTS					
INSECTS					
ANIMALS					
CIRCLE 2	moist dry sun shade	moist dry sun shade	moist dry sun shade	moist dry sun shade	moist dry sun shade
SKETCHES					

Middle Elementary

Ian Smith

INVESTIGATING MAN'S ROLE IN THE ECOSYSTEM

BEHAVIORAL OBJECTIVES:

At the completion of successful encounter, the student should be able to:

1. Define the concepts of ecology and ecosystems.
2. Draw a sample ecosystem composed of components that can be found around the school.
3. Draw a food chain which includes man.
4. List (number) substances found at home which could alter the environment.
5. Identify how each of the above mentioned substances alters the existing ecosystem in which it is used.
6. List (number) existing state or federal regulations that govern the use of each of the substances.
7. Develop a plan which would lead to the discontinuation of use of selected substances.

ACTIVITIES:

1. Research and discuss the concepts of ecology:
    a. What is a food chain?
    b. What is an ecosystem?
    c. How are things inter-dependent?
    d. What is included in an ecosystem?
2. Take a tour of the school site as an ecosystem. The students then should draw the ecosystem of the site and the food chain which can be found on the site.
3. Have the school nurse or cook present a talk on what makes up a good balanced mean. Relate to an ecosystem which includes man as a consumer.
    a. Can you tell where each food comes from?
    b. Where does the food acquire its energy needed for growth?
    c. Do all organisms get their energy directly from the sun?
    d. How does man fit into the food chain (Produces, decomposes, consumes)?

4. Have the children check at home to find what environmentally altering substances they may have (suggestion: fertilizer, washing materials, pesticides, etc.).

5. Discuss with the students the uses of the substances:

   a. What are good points of each?
   b. What are their bad points?
   c. What effect do they have on the ecosystem if used properly?
   d. What effect will they have if used improperly?

6. Write the appropriate state and federal governments:

   a. What laws do we have on the use of each of these environmental altering substances?
   b. Are the laws the same in all states?
   c. What new laws are being made?
   d. What penalties are there when one of the laws is broken?

7. How can you become involved in eliminating some of these substances in order to reduce harmful effects on the environment?

Upper Elementary

W. Forry

INVESTIGATING PESTICIDE LEVEL IN THE FISH OF A SUBURBAN POND

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Describe in writing the definition of a pesticide.
2. Trace pesticide from source of application through a food chain.
3. Describe in writing the level and kinds of pesticides found in the fish life of a pond.
4. List in writing (number) ways in which pesticides get into the pond.
5. List (number) disadvantages to the residents around the pond of a pond contaminated with pesticides.
6. Describe in writing a plan for informing the residents of the level of pesticide contamination, sources of contamination and adverse effects of contamination on residents.
7. Describe in writing the major steps of a plan for eliminating one of the sources of pesticide contamination.

ACTIVITIES:

1. Seek information from reliable sources on pesticides.
    a. What is a pesticide?
    b. What are insecticides, herbicides, and fungicides?
    c. What pesticides are long lived and pass from one link of the food chain to another?
    d. What pesticides are available to replace these long lived pesticides?
    e. How does the use of the long lived pesticides affect man?
2. Study the Pond Food Chains. Draw and illustrate on paper two food chains--one including only pond life and the other including man.
3. Determine the amount and types of pesticides found in the fish of the pond by sending a sample specimen to an appropriate laboratory such as that of the Bureau of Commercial Fisheries.
    a. Does the test show any presence of the long lived pesticides such as DDT or dieldrin?
    b. How much of this long lived pesticide can an animal have before it is harmful to their reproduction capacities or before it is unsafe to use this animal as human food?
    c. What would traces of pesticides in the fish indicate about the pond?
    d. How does the presence of pesticides in the fish limit the use of the pond?

3. (continued)
   - e. Does presence of pesticides in the fish mean anything to residents who want to enjoy fishing in the pond?
   - f. How does the fisherman who fishes just for sport feel?
   - g. How does the fisherman who fishes for food feel?
   - h. Where did the fish obtain this pesticide?

4. Take a field trip to the pond and the area that drains into the pond with the Soil Scientist from the Soil Conservation Service.

   - a. Where does the water come from that drains into the ponds?
   - b. Is there any evidence of pesticides getting into these sources?
   - c. Where do the residents around the pond apply pesticides on their property?
   - d. Have any pesticides been applied directly to the pond?

5. From the data gathered thus far make a fact sheet describing:

   - a. Location, age, size and name of pond.
   - b. Kind and level of pesticide contamination.
   - c. Sources of pesticide contamination.
   - d. Adverse effects upon residents.

   Distribute this fact sheet to residents around the pond, township officials and other interested persons.

6. Make a plan for eliminating one source of pesticide pollution in this pond.

   - a. Would such organizations as "Home Owners' Associations", or the local "Lake Association" be concerned with these problems?
   - b. Would home owners around the pond change the type of pesticides they use if they realized the ones they used were polluting their pond?
   - c. How would you find out what pesticides are being used by home owners around the pond?
   - d. If home owners are concerned about their pond, which source of pollution should they pursue first?

Upper Elementary

Irene Muirhead

INVESTIGATION OF THE "EDGE EFFECT" WHERE GRASSLAND AND BRUSHLAND JOIN

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. State (number) physical characteristics of the grassland.
2. Describe (number) types of plants you would find living in the grassland ecosystem.
3. Identify in writing (number) animals that would be found in a grassland ecosystem.
4. State (number) physical characteristics of the brushland.
5. Describe (number) types of plants inhabiting the brushland ecosystem.
6. Identify in writing (number) types of animal life found in the brushland.
7. Explain in writing an "edge effect."
8. Illustrate the physical components of an edge where grassland and brushland join.
9. Identify (number) types of living things he would find in this edge.
10. State what he feels are the benefits of the existence of an edge effect in terms of types and numbers of living things.
11. Plan an edge within this community.

ACTIVITIES:

A field trip to a grassland and brushland area. (If not possible, view a film study of these two areas.)

1. Grassland field study: Carry out a site inventory of the physical features of the grassland. What is its life form? Is it all grasslike? Is the ground flat or rolling countryside? Is it moist or very dry? Does the soil seem to be rich deep soil or is it hard with a thin layer of top soil? Is the sunlight intense? Does it seem windy here? Do you think it is sometimes? Why or why not? Are there hot summers here? Long, cold winters? Do you think blizzards occur here? (relate all ecological aspects which are further possible at the site.)

2. Predict what kinds of living things would be found in this ecosystem:

   a. Would there be moisture-loving plants? Plants with broad thin leaves? What kind of root systems do most of the plants have? Do they grow close under the surface of the ground or deep in the soil? Do you think all plants would live for only one year?

   b. Would there be tree climbing mammals or tree nesting birds? Why or why not? What kinds of mobility might you see in the animals inhabiting this area? Jumping animals? Running animals? Why? Do you think you would see animals adapted for digging? Why? Do any of these animals hibernate? Where would a good place be? Can they do this here? How?

   c. Would you see birds with webbed feet? Why or why not? Would the birds tend to be seed eating? How do you explain your answers? How about the coloration of birds and animals of this area? Do you think brightly colored birds or tan colored birds would live in this area? Explain why? Are any of these birds migratory birds? If they don't migrate how and where do they spend their winter?

3. Research Activity: Can be done in groups or individual activity but information should all be brought together for total summary of inhabitants of grassland ecosystem.) List specific plants, animals and birds you would expect to find, according to the previous inventory, in the grassland community.

4. Make a bulletin board showing all 3 aspects; the plant life, animals and birds life that you found inhabited the grassland.

5. Brushland field study:

   Conduct a similar inventory of plant life, animal life and bird life for the brushland area.

6. Make adjoining bulletin board (or long mural if bulletin board is not available) depicting brushland ecosystem.

7. Knowing what a grassland consists of and what a brushland consists of, do you think there are any inhabitants which you listed that enjoy both ecosystems? What are they? (Remember their food needs, nesting needs, reproducting habits and physical characteristics.) Where would these animals be most content? Where might you find an area that has some features from both the grassland and brushland areas? Make (individuals) an illustration of an area including as many characteristics from both ecosystems as you possibly can. (This new ecosystem made up of features both the grassland and the brushland ecosystem is called an edge or ecotone.)

8. Make a list of all the wildlife you might find inhabiting the edge between a grassland and brushland.

9. Now a group can add this illustration to join the grassland and brushland areas on the class mural.

10. Discuss the importance of the edge. We have learned that some birds and animals require both brushland and grassland in approximately equal amounts. What would some animals do without an area such as this? Would they move? Where would they go? Which area would you find more animals? Does the edge effect have more or fewer living things than the grassland or woodland? Are there more or fewer types of living things in the edge?

11. Explain in writing what you think the function of an edge is in terms of creating living conditions, providing food, making nesting possible, providing protection and insuring reproduction for certain animal and bird species.

12. Does man ever create an edge effect? How would you do this? Could this be a project to help certain types of animal life? How would you go about it?

    (At the edge of a grassland and brushland an ecotone could be created by planting shrubs and other wildlife brushes as a class project.)

Junior High
Science

William Veegaete

INVESTIGATING A GRASSHOPPER POPULATION

BEHAVIORAL OBJECTIVE:

At the completion of a successful encounter, the student should be able to:

1. Make an accurate estimate of an animal population in relation to its immediate environment.
2. Identify two ways that math is important to solve scientific problems.
3. Describe four basic controlling factors of populations and how the degree of their interaction determines the population of a species for a particular area.
4. Name seven natural factors that have a bearing on the four basic population controls.
5. Draw the grasshopper in a food chain which is related to the study area.
6. Identify a major problem that could be caused by an over population of grasshoppers.
7. Describe in writing how a reduced population may upset the local ecological balances.
8. Describe ways in which man controls insect numbers - both old and new.
9. Describe why the estimate of the grasshopper population was probably not accurate, but if the same methods were used on a larger animal with fewer numbers (e.g. rabbits or deer) the estimate would be fairly accurate, thus becoming a valuable conservation tool.

ACTIVITIES:

A trip to a parcel of land.

1. What do you think the grasshopper population of a specific field is? Do you think it would be higher in a woodlot?
2. As you look at the area what do you feel would be the grasshoppers' prime source of food?
3. To estimate the population we will use the mark, release and recapture method. The first day you will go into the field with a net, paint brush, and paint. Catch as many grasshoppers as possible, mark them with a small dab of paint, then release them. Keep an accurate count.
   The second day capture as many grasshoppers as possible and in a separate column mark down the number of recaptures from the previous day.

Now using the formula $\frac{\text{No. Marked}}{\text{Total Pop.}} = \frac{\text{No. Recaptured}}{\text{Total 2nd Capture}}$

an estimate can be made.

4. As you look over the results, why do you think we only recaptured a small portion of the grasshoppers marked the previous day? How do you think their loss was balanced out?

5. What do you think would be some natural conditions that would affect emigration, immigration, natality and mortality?

6. As you walk around, what types of animals do you see in the area? Why are they important to the area? What types of food do they eat? Draw a food chain linking the grasshopper to these animals.

7. What effect would an over population of grasshoppers have on an area? (Show the movie "Rival Worlds", Shell Oil Company).

8. How do you keep down the number of insects around the house? What about farmers? How can we control insects without the use of harmful chemicals?

9. Read "The Whitetail Story" by the Department of Natural Resources and evaluate, in a class discussion, the importance of population studies in determining the number of doe permits for certain areas.

Junior High
Business or Social Studies

Leonard Thuemmel

INVESTIGATING THE USE OF PESTICIDES BY INDIVIDUALS AND LOCAL GOVERNMENT

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Define what a pesticide is.
2. Identify the major pesticides presently being used in the community.
3. List (No.) potential dangers and actual damages which will result from their use.
4. Describe in writing the existing local state, and national, laws governing the use of pesticides.
5. Identify one usage of chlorinated hydrocarbons in the community and state an alternative to control the target pest.
6. Identify (number) persistent pesticides being used in the community.
7. Identify the types and amount of pesticides used by local government.
8. Identify the types and amount of pesticides used by local people.
9. Identify the major usage of pesticides in the local community: individuals or government.
10. Develop a plan of action to resolve one of the local pesticide problems.

ACTIVITIES:

1. Carry out a short inventory of what a pesticide is.
    a. What is covered by the term pesticide?
    b. What is a pest?
2. Have a county agricultural extension agent come in & speak on pesticides.
    a. Identify different kinds of pesticides.
    b. What are the major kinds of pesticides used today?
    c. What are some of the more harmful pesticides and their effects?
3. Obtain information regarding the present, local state and national laws that govern the use of pesticides in the state. (County agent, Department of Agriculture, Michigan State Extension.)

4. Identify the major chemicals that are persistent and have serious lethal side effects.

5. Determine the types of chemicals and alternative programs that are more ecologically sound in pest control.

6. Contact a local official and determine the kinds and amounts of pesticides being used by the local government.

7. Have the class survey the major stores in the area that handle pesticides to determine the pesticides they handle and the approximate sales.

8. Compare the two figures to find out who is the big user. (Local people or local government.)

9. Have the class go around and talk to their neighbors to determine:
   a. The kinds of pesticides they use.
   b. The amount of pesticides they use.

10. Interview a tree service in the area (see yellow pages) as to their methods of pest control.

11. Chart the different types of pesticides that are used in the area to give an indication of local usage.

12. Establish a plan of action to reduce the usage of persistent pesticides and to educate some population segment about more ecologically sound pest control measures.

13. Implement the plan.

High School
Science

James Godo

INVESTIGATING THE RELATIONSHIP OF AN URBAN COMMUNITY TO CERTAIN BIRDS AND SMALL ANIMALS

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter the student should be able to:

1. Identify (number) types of ecological communities within the study area.
2. Identify (number) species of birds and numerous small animals within each of the ecological communities mentioned in objective number one.
3. Describe the interrelationship of one of the animals (identified in Behavioral Objective number one) to his environment.
4. Describe how unbalanced environmental conditions can result in the extinction of certain animal species, and the over-production of others.
5. List (number) ways that man has upset predator-prey relationship within any or all of the ecological communities identified in behavioral objective number one.
6. List (number) ways that small animal life are directly and indirectly beneficial to the total urban community.
7. List (number) ways that urban problems can cause deterioration of small animal life.
8. Identify at least (number) ways that the ecological communities described in behavioral objective number one can be preserved.
9. Identify the land owners and managers and influential citizens of the local community regarding the preservation and maintenance of ecological communities in this local community.
10. Develop a plan of action for preserving and maintaining ecological communities in the local community.

ACTIVITIES:

1. Identify and classify plants found in one of three ecological study areas, i.e., grassland, shrubland, climax forest.
   a. What seems to be the relationship of these plants to soil type and moisture content of the soil?
2. Prepare a field survey to determine the numbers and varieties of different insect, and lower animal species inhabiting the study areas. Are certain animals confined to certain ecological niches?

3. Prepare a field survey to determine the numbers and varieties of different bird species inhabiting the area. (Concentrate on non-migratory types.)

    a. Do certain species of birds seem to be confined to certain ecological communities within the study area?

    b. Are nesting habits directly or indirectly related to the ecological niche - the bird occupies?

4. Construct one food-chain for each ecological community cited in behavioral objective number one.

    a. Are these good-chains overlapping from one ecological study area to another?

    b. Have any of these food chain links been altered? If so prepare a chart showing where the links have been altered and how.

5. List (number) different ways that animals in each of the study areas protect themselves.

    a. Do any depend on each other for protection?

    b. What are some means of protection employed other than shelter?

    c. Prepare a list of the ways urban development may have altered the scheme of protection for certain animals.

6. Prepare a list of animals which seem to be over-abundant.

    a. What is the supply of food for this animal?
    b. From observation, what does the conditions of the animal appear to be?
    c. What is one natural enemy of the animal in question?
    d. Is it found in good numbers in the study area? If not, why?

7. Make a chart showing (number) ways small animals directly and indirectly benefit the ecological community of study area and also the surrounding urban area.

    a. Compare numbers of insects to numbers of other kinds of animals. What seems to be the relationship, if any?
    b. Is soil fertility related to the presence of absence of certain animals?
    c. Aesthetic awareness differs, but list what you think are the types of aesthetic values maintained by having small animal communities within the urban environment.

8. Identify certain environmental problems within the urban area.

   a. Which one problem or problems seem predominant?

   b. Do they effect all of the ecological study areas, or just specific ones?

   c. Do certain animal species seem to be more effected than others?

   d. What is the relationship between the effected animals and the rest of the ecological community?

9. Outline a plan for active preservation and improvement of ecological environments with the urban community.

   a. Contact the proper authorities, i.e., city council, township supervisiors, planning commissions, zoning commissions, private land owners.

      1. Make them aware of the ecosystems and their benefits.
      2. Clearly present by means of charts, drawings, slides, films, etc. the geograpnic areas in question.
      3. Outline your plan for preservation or improvement or both for the areas in question.

   b. Contact civic groups and repeat the procedures outlined in (a.).

   c. Contact the mass media so that the public can become aware of the action plan so that they may insure the success of the progran.

10. Follow-up activities which can be carried out directly by classroom students and other young people.

    a. Establish new habit areas for certain animal species, i.e., brush piles, artificial nesting areas, etc.

    b. Cutting, thinning, separation, etc. to insure health of resident species and to encourage arrival of new species.

    c. Introduction of new (imported) species to balance an area.

    d. Installation of nature trails to facilitate observation and enjoyment.

Lower Elementary

Dolores Furesz

INVESTIGATING A SOIL PROBLEM ON THE SCHOOL SITE

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Explain the origin of soil.
2. Identify the three areas of a soil profile.
3. Explain what is needed in soil for good plant growth.
4. Draw (number) pictures that show how people are dependent (directly or indirectly) on soil.
5. Relate orally (number) ways that soil can be abused.
6. Identify a problem area of soil misuse around the school site.
7. Identify (number) individuals who might help in resolving the problem.
8. Submit a plan to remedy the situation.

ACTIVITIES:

1. Tell where you think soil comes from (oral pretest).
2. Go out on the school site and collect or dig up some rocks.
    a. Separate the rocks into two piles: sedimentary (sandstone, limestone) and igneous rocks. (Rock classification can be done by using research center with teacher and research center coordinator).
    b. Using the sandstone or limestone, rub two rocks together over a piece of newspaper (soil particles can be made by rubbing two rocks together).
    c. Using a hard (igneous) rock, place it in an old sock, and hit it with a hammer (chips are pieces of soil).
    d. In nature soil particles from rocks are made by rain, water, wind, frost, lichens and plant roots.
3. Take a soil sample on the school site with an auger. (Obtain from research center or from local soil conservation consultant). If one is not available use a shovel.

4. Identify the three areas of the soil profile: topsoil (A horizon), subsoil (B horizon), and parent material (C horizon).

   a. Experiment with each to see its fertility: Place a sample of each soil in three pots, and plant fast growing seeds. Which grew the best? Why? (Topsoil - has the most organic matter.)
   b. Examine the three soils with a magnifying class. What do you find in the topsoil that is not found in the other two? (Decayed plant and animal matter).

5. Experiment with water penetration in sand and clay. Fill two jars with samples of each soil. Pour equal amounts of water in both jars. In which jar does the water pass through faster? (sand)

6. Examine the need for ground cover. Use two boxes, both with a screen on one end. Fill one box with soil and one with sod. Tilt both boxes upward, the lower end being the screen end. Have the screen ends resting on shallow pans. Pour equal amounts of water in each. Watch for amount of water entering plants. Which one loses the least water? (the box of sod - ground cover holds the water.)

7. Show slides depicting ways that soil can be destroyed.

   a. Erosion: wind, water
   b. Exhaustion of nutrients
   c. Burning
   d. Overgrazing
   e. Removal of surface plants.

8. Look for a soil problem area on the school site.

9. Identify the type of soil problem that it represents.

10. Take a soil profile of the problem area. Is there any A horizon (topsoil)? Does it contain any organic material? (Use a magnifying glass.) Is it heavily vegetated? Will watering help this problem or make it worse (cause more soil erosion)?

11. Use a soil testing kit. (Research centers have a test kit that tests for nitrogen, phosphorous and potash, and also checks the acidity or alkalinity of the soil.) What minerals, if any, can be found in the topsoil? Why are these minerals important?

12. Make a chart listing all the information gathered about the problem area on the school site.

13. Invite the Soil Conservation Agent of your county to come and suggest remedies based on your information (in Macomb County consult Mr. Tom Gough).

14. Prepare a plan using the information given by the Soil Conservation Agent and the suggestions of the students.

15. Present your plan to the principal, the Student Council, to an all-student assembly, or all three.

16. Enlist the help of the above individuals to remedy the soil problem on the school site.

17. Implement the plan.

Lower Elementary Loraine Turcotte

INVESTIGATING THE PLANNING OF A CLASSROOM

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Describe the location of their classroom in the school building.
2. Describe the present appearance of their room.
3. List the students' equipment for that room.
4. Identify (number) activities that take place in their room.
5. Design new arrangements or plans for ones room in order to better carry out desired classroom activities.
6. Carry out proposed new arrangements.
7. Discuss the concept and purpose of planning.
8. List (number) ways one plans for daily activities.

ACTIVITIES:

1. General orientation discussion: Do you like where your tables and chairs are placed in this room? Would you like to put your toys in another area? Would you like to change the equipment and furniture in your own way?
2. Where is your room from the front door of the school building? Is your room by other Kindergarten rooms? Are you close to the principal's office? What area is outside your classroom window?
3. Is your room larger than other kindergarten rooms? Are your fixtures, sink, counters, built for your height?
4. What equipment, supplies do you need for your classroom? Why? Name some equipment the teacher needs. Name some equipment or facilities we all need?
5. Name some of the activities you do in this room. List activities that you would like to do but have been unable to carry out in the room? Why? Can a new arrangement allow for new activities to take place?

6. Remove all furniture, cabinets, play equipment from our classroom. Now we will go back into our room, walk around and try to figure out new arrangements or plans. An outline of the room would be drawn on the blackboard. Questions could then be asked about new arrangements of furniture in the room. Where would you like to place your tables and chairs? Why? Where do you want to place your toys? Do you need a lot of room around your toy area? Why? Where are you going to place your school supplies? Should they be near your desk? Find a spot for our snack time supplies. Where do you want the teacher's desk and file cabinets? Should they be close together? or not? What about a special place for "show and tell?"

7. Are there any other facilities, equipment, or toys that might be helpful to us in our classroom? If so, how might we obtain them? Do we list the reasons why we need them? Find out their availability. Make a presentation to the principal, P.T.O., etc.

8. Design a new arrangement of the room that would be more conducive to the activities that occur there. Once design is made, carry it out after receiving proper authorization.

9. After new arrangement has been accomplished, review the activities that preceded it. Why did we think of the various uses of the room before rearranging it? Why did we list existing equipment and desired equipment before actual rearranging? These preliminary activities before the major event is called planning. Do we plan for school? Lunch? Bed? Play? How and why? Do we plan in working outdoors with the land, trees, gardens, etc? Why? Discuss the importance of planning ahead.

Lower Elementary

Dolores Furesz

PLANNING A COMMUNITY

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter the student should be able to:

1. Explain the ecological concept of a community.
2. Identify (number) parts of the student's community.
3. Describe (number) ways that the natural features of the land influenced the land use in his community.
4. Demonstrate by role playing the concerns of (number) parts of his community as it grows and carries on its daily activities.
5. Demonstrate through role playing the task of the planning commission to take into account all possible interests of a community when planning for its development.
6. Write out a plan to improve one visual blight of the community.
7. Construct a model of the community for demonstration purposes.

ACTIVITIES:

1. Look at a filmstrip or film that explains the parts of a community (schools, industry, business, housing development recreation medical facilities, commercial services). What is a community? Do each of its parts help one another? What is meant by inter-dependency? How does each one depend upon each part of a community as shown in the filmstrip? Do you have all these parts in your community that are shown in the filmstrip?
2. Look at slides that show the parts of the student's own community. Can you identify the major parts of your community?
3. Invite a resource person to tell the history of the area. Have them relate what effect the natural features of the community had on its development. (the river, the Indian trail, fertile farm land).
4. Draw a mural depicting the early history of the community.

5. Using the flannel board as the community area, label the major features of the student's community. These could be a river, a flood plain, flat land, rolling land.

6. Using flannel board cutouts, place factories, schools, parks, clinics, shopping centers, etc., over the community area. Where are these places located in the community? Can you identify possible problems as a result of their location in relation to land features? Why? Do you see ways that any of these could be changed?

7. Discuss the physical appearance of the community (trees, hills, signs, buildings). What do you like best about it? What don't you like about it? Do you see any ways that the community could improve its appearance?

8. Write a letter to the local newspaper telling of one visual blight and how you would improve it.

9. Role play by taking turns at being a business man, a land developer, a factory owner, a farmer, a recreation official, a home owner, etc., and tell why you are important to the community and why you want to locate in a certain area of the community. What are your interests? What does the community receive from you? What do you depend on the community for?

10. Choose one community interest group. Write a story telling why you, as a member of this group, are important to the community.

11. Form a "planning commission." Choose one person to represent each interest group. Develop a plan for the community through discussion and concessions.

12. Construct a simple model of the community, using moveable houses, buildings, trees. Have the group move the parts around to show where the various parts of the community are now located and how they would change some of these. Why?

13. Display the plan in the research center. Have the group explain the model to other students, showing present locations and telling how and why they would change certain areas of the community.

Middle Elementary Ian Smith

INVESTIGATING AN AREA OF LAND

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Write a history of the land area in question.
2. Identify the present use of the land.
3. Describe in writing the zoning regulations for this land.
4. Draw a simple topographic map of the area including identification physical and natural features.
5. Draw a soil profile of the land.
6. List (number) of owners and/or controllers of land in question.
7. List 4 alternate uses of the land.
8. Draw 2 plans showing 2 of the 4 alternate plans listed in number 7.
9. Present plans to the committee which controls planning of the land.

ACTIVITIES:

1. Take a tour of the land noticing:
    a. What is the present land use?
    b. What are the geological features?
    c. What are the artificial features?
    d. What type of terrain is this?
    e. Can you suggest some possible uses?
2. Write to the state highway department requesting topographical maps of the area.
   Have students draw on these maps the location of existing features (buildings, streets, plant life).
3. Visit the city or county library or records offices:
    a. What is the past use of this land?
    b. How is it zoned?
    c. What are the other restrictions on this land?
    d. Who owns and controls this land?

4. Take samples of the soil. What is the soil made up of? What is it good for? What is its profile? Where would you find this out? Can you draw this?

5. What other factors should you consider when surveying a parcel of land?

6. Is the land being used properly according to legal, ecological and geological factors? If not what are some of the alternatives? What would you suggest is the best use?

7. Construct the best alternatives, if any, as a plan and present them to the controllers of the land (check #3 above) as a possible use for this land.

Middle Elementary

Emily Klopfenstein

ENFORCEMENT OF A SOLID WASTE DUMPING POLICY

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Locate an area with an illegal solid waste dumping problem.
2. List in writing (number) reasons why this is a problem.
3. Report and present evidence to local police concerning the dumping problem.
4. Identify and contact other community officials about continued and broader enforcement.
5. Plan an anti-litter campaign.
6. Publicize and assist in carrying out the planned anti-litter campaign.

ACTIVITIES:

1. Take a drive along local country roads and survey areas where solid waste dumping has occurred. Choose a particularly bad dumping area. Take pictures for evidence.
2. Is it fair for individuals to spoil areas particularly those on public property and within public view? What undesirable animals can the dumping of garbage attract? Is such an area safe? Can the area be enjoyed? What happens when an area starts being used as a dump? How costly is the problem? Who pays the price? What does the law say? Are there legal dumping sites available?
3. Contact the local police. Ask for their cooperation. Can they help watch for the violators and gather evidence? Will they arrest them? Can the owners assist? Can the students attempt to catch the violators with a camera?
4. Ask the police to advise what other officials could publicize the effort. Could the newspapers publicize it? Write to one's state senator and state representative asking for information on other such campaigns.

5. Locate a public area which has a serious litter problem. Photograph this area. Make posters and announcements inviting people living in the immediate area and others to participate in a clean-up campaign. Attach the photographs to the posters. Publicize the use of litter bags in the car. Contact an agency such as AAA to see if litter bags could be distributed. Are waste barrels needed? Could they be provided.

6. Conduct the clean-up and photograph the results. Publicize the results through before and after pictures in the newspapers and on more posters. On the posters remind people to keep the area beautiful. Distribute the litter bags and place barrels in the area if they are provided.

Upper Elementary

Dorothy Cox

OPERATING MINIBIKES IN THE COMMUNITY

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Describe in writing (number) problems minibike operation creates in the community.
2. List in writing existing regulations for minibike operation at school and in the community.
3. Draw an accurate map of streets in your immediate area showing location of fields, woods, and school.
4. Identify power structure (school officials, governmental policy makers, governmental committees) of his community who influence and make policy on minibike rules and regulations.
5. Describe in writing alternate solutions for safe, legal minibike operation.

ACTIVITIES:

1. Visit home of nearby minibike owner for observation of:
    a. What is size of minibike? In relation to rider? In relation to size of ordinary vehicular traffic?
    b. What is speed and maneuverability of a minibike?
    c. Note noise level of bike when starting and in operation.
2. Tour nearby streets from _______ to ________ to include woods trails and note following:
    a. What is surface of roads? Is this a hazard to minibike rider?
    b. Is there a visual problem at crossroads? What effect would an unseen car have? What effect on unseen child walking or riding a bike? Would sound level of minibike allow rider to hear either one?
    c. What is effect of bike trails in woods? Note hard pack trails. What animals do you see? What birds do you see or hear? Do you think noise and trails effect them in any way?

3. Draw a map of area locating fields and woods.

4. Survey residents of area obtaining their opinions on:
    - a. Any objection to minibikes?
    - b. Where do they think owners could or should ride?
    - c. What hazards do they see for rider? for the community?

5. Seek information by visit (either at school by officer, or by class at police department) from police on rules and regulations regarding minibikes:
    - a. What does ordinance say?
    - b. Are regulations enforced? What are penalties?
    - c. Are there any existing or proposed areas for riding?

6. Interview school principal to determine school policy on minibike riders. If principal does not determine policy, who does?

7. Visit township offices to interview personnel to determine:
    - a. Who makes rules for minibikes?
    - b. Is there an area available for minibike riding?
    - c. Is there an area proposed?

8. What can the class do to help solve problem?
    - a. What are possible alternate solutions?
    - b. Who can be contacted to facilitate solutions?

9. Develop a plan from chosen alternatives and carry it out.

Upper Elementary

Emily Klopfenstein

PLANNING A BEAUTIFICATION PROJECT FOR A SHOPPING CENTER

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. List (number) ecological and aesthetic concerns relating to the present plan of a particular shopping center.
2. List (number) improvements which could occur to minimize the issues listed in behavioral objective number one.
3. Describe the ecological reasoning for each of these improvements.
4. Build a model of the shopping center with movable parts in order to show its present status and its status with improvements.
5. Demonstrate the best possible arrangement in terms of ecology and aesthetics.
6. Plan a presentation of the ideas concerning the shopping center with an explanation of the model to the shopping center managers and various city officials.

ACTIVITIES:

1. Take a field trip to the site. Use a camera so slides can be taken in case it is necessary to refer to them later. Are there any plantings? Do the signs blend in with the environment? Is there any area for relaxation? Does the area provide for the separation of people and cars. Have litter baskets been provided for waste disposal? Does the water stand in the parking lot or is there good drainage? Is there good access to the highway? Is there access for mass transit?
2. Suggest ways to beautify the site. What plantings could be brought in? Could they be planted directly in the ground or would they need a planter? Design an attractive sign for the store front. Could a courtyard area with benches be designed? Where could walkways from the parking rows be placed? Where could litter baskets be placed? Observe the parking lot after a rain? Does the water run off toward a drain? Where are the main roads? Is there at least one wide entrance and exit at each. Where could bus stations be placed?

3. What are the benefits of plantings? Why is a sign that blends in with the environment more aesthetically pleasing? Why would it be beneficial to provide some recreation? What safety and aesthetic benefit is there in seperating people and cars? Why are litter baskets needed? What are the hazards and inconveniences of a parking lot with poor drainage? Why should access be convenient? Would a mass transit station encourage more people to come by bus?

4. Using cardboard make a model of the building and existing areas. Small boxes could serve as benches and planters. Minature bushes and flowers could be bought at a dime store. Allow the improvements to be movable so they can be changed around in order to get the feeling of design and different points of view.

5. Try different locations for the beautification features of the improvements. Mark drain areas and road and mass transit access. Rearrange the model until the arrangement corrects the faults using the space efficiently.

6. Secure a location for display of the model in the school. Go to the office of the shopping center with the list of problems and improvements and explain how the model was built. Ask permission to display the model to the public.

Upper Elementary

Wilma Forry

INVESTIGATING THE LEGAL CATCH LIMIT ON FISH

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. List (number) reasons in writing why he feels there is a legal catch limit on game fish.
2. Identify in writing the number of years there has been a legal catch limit.
3. Identify in writing the governmental agency which enforces this law.
4. Describe in writing the penalty for breaking this law.
5. Name in writing your local law enforcement officer and where you can contact him.
6. List (number) reasons you feel this law is necessary.
7. Write (number) steps to a plan to: a) support this law if you agree with it; or b) change this law to what you believe it should be.

ACTIVITIES:

1. Have the class participate in a fishing experience.
    - a. How many fish are we allowed to catch?
    - b. Is the number different for children than for adults?
    - c. Why is there a limit to the number of fish we can take?
    - d. Is there a shortage of fish in this lake?
    - e. Does it have anything to do with sharing?
    - f. What is meant by good sportsmanship and does it apply here?
2. Invite the local Conservation Officer as a resource person.
    - a. What are the reasons for fish catch limits?
    - b. When did this become a law?
    - c. Are the reasons for the law the same today as they were then?
    - d. What governmental agency is responsible for enforcing this law?
    - e. What is the penalty for breaking this law?
    - f. How do you feel about this penalty?
    - g. Who enforces this law in our area and where can he be contacted?

3. Make a plan to support or change the legal fish catch law.

    a. If you agree with this law and support it:

        1. Should you obey it?
        2. Can you remind law breakers of the law and why it is to their benefit to obey it?
        3. Can you report law breakers who do not listen to reason?

    b. If you would like to see a change in the law:

        1. What should be changed and why?
        2. What is the governmental process for a change to occur?
        3. What is the first step towards this change?
        4. What can you do to start this change?

Junior High
Art

Evelyn Ayres

LANDSCAPING THE GROUNDS AROUND A SUBURBAN HOME

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, a student should be able to:

1. Identify (number) major concepts of landscape design that apply to the landscaping of a home.

2. Describe how the major concepts of behavioral objective #1 could be utilized to redesign the landscape of a yard around a suburban home.

3. Identify from observation (number) special problems regarding the landscaping of a particular parcel of land.

4. Identify (number) values of beauty, spaciousness, and privacy around the house to the resident.

ACTIVITIES:

1. Field Trip —
   After arrangements have been made with the homeowner, visit the homesite in groups of ten. Choose a chairman for each group.

2. Make three preliminary sketches
   - a. Make a quick sketch of trees, shrubs, and plants as they exist.
   - b. Make an illustrative sketch of a view of the house with the landscaping as you would desire it to be.
   - c. Make an empty space layout to fill in back in class.

3. Contact homeowner to find out what part of his grounds he wishes left unchanged. Relay this information to the class.

4. Hold an open discussion (presided over by a student chairman) as to the best plan of action. Some issues to be discussed might be:
   - a. What trees and shrubs to transplant and where.
   - b. Where flower beds go, and what flowers for easy care.
   - c. What plants might replace spring flowers and bulbs after blooming.
   - d. Discuss different flowering seasons.
   - e. Facts concering soil and fertilizer.
   - f. How to care for annuals and perennials.
   - g. How to transplant small evergreens, etc.

5. To obtain information, visit a local nursery after school to obtain answers to questions raised in class. As groups are visiting the homesite, students in class could be doing research and the correlation of art work.

6. Draw from life ten sketches of plants, flowers, or living things such as birds, insects or animals. Students may use reference books.

7. Finish three plates from the above ten sketches in pastels, watercolor, and ink. Craft classes could work in the media of clay, or printmaking.

8. List and identify flowers, plants, trees, birds, insects, and grasses you have observed in this encounter. (Two each).

9. On a chart, show how many types of life depend upon each other for food. Tell what might happen if one segment of the food cycle were eliminated.

10. Work out a timetable of the work needed to be done each day. Divide in groups, or volunteer to work for a day.

11. Describe in a few instructions how to care for the landscaping which was completed, and a chart of what was transplanted.

12. Evaluate in a group discussion, then visit the homeowner on the success of the project. Discuss:
    a. Did I learn of any area problems of which I was not aware?
    b. Has awareness of nature, ecology, and man's environment increased?

13. When project is completed, show the work of the encounter on a special bulletin board at school.

14. Give the story to the newspaper.

Junior High
Science / Social Studies

William Veegaete

INVESTIGATING THE DEVELOPMENT OF A SHOPPING CENTER

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to

1. Identify (number) environmental problems associated with particular shopping center.
2. Identify the types of people that use the shopping centers.
3. Describe in writing the value of a well planned and designed shopping center.
4. List (number) ways in which a shopping center can be constructed so as to appeal to all age groups and provide a pleasant place for relaxation.
5. Design a more beautiful and feasible plan for a shopping center than presently exists.
6. Identify the people upon which the cost of such designing would fall.
7. Construct a plan which would prevent shopping centers of low environmental design from being built in the community.

ACTIVITIES: A trip to a local shopping center, or a bus tour to several.

1. What types of people use this shopping center? Does anyone use it for anything other than shopping?
2. Take a series of slides comparing various shopping centers in the area.
3. What observations can be made about scenery, micro-climate, traffic patterns? What do you prefer?
4. Compare this shopping center to one of the larger ones in Detroit area such as Eastland or Northland. What differences are there?
5. As you look around you, can you think of any multiple use for this area (social center, art fair, speakers, dancing, exhibitions, etc.). What types of people might enjoy the uses you suggest?
6. What would you suggest be added to this shopping center to make it more attractive, enjoyable and thus bring more people to the area to do their shopping?
7. Lay out a new design for the shopping center which will take into account environmental design concepts.
8. Make two models of the shopping center; one as it looks now and the other exhibiting the new environmental design that you propose.

9. If your plan for remodeling the shopping center were to be adopted, who would have to assume the cost? Do you think store owners would be willing to spend this money? How would two different stores such as, for example, Farmer Jack and American Bakery share the costs?

10. How could this problem have been solved in the first place? What can be done to upgrade future shopping centers in the area?

11. Develop a plan of action and present it to the proper political department in your community.

High School
Government

William B. Stapp

FLOOD PLAIN ZONING

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Draw on a map of his community the flood plains (50 year flood line) of the (name) River from (location) to (location) and record accurately how each flood plain is developed.

2. Describe in writing the number of floods and flood damage that has occurred on the flood plains of the (name) River from (location) to (location) over the past 60 years (or over the time that records have been filed).

3. Describe in writing the major provisions in the laws of this state and community regarding flood plain zoning.

4. Identify the power structure (pressure groups, governmental committees, governmental policy makers) of his community regarding who influences and makes policy on flood plain development and zoning.

ACTIVITIES:

1. Take a tour (or illustrate by slides) along the (name) River from (location) to (location) and note the following:

   a. Are there a series of flood plains?

   b. How are the flood plains developed?

   c. Approximately how much damage (dollars, lives, inconveniences) has occurred on the flood plains as a result of flooding over the past 60 years?

   d. What does your state flood plain ordinance say? If none exists, is it considering an ordinance?

   e. What does your community flood plain ordinance say? If none exists, is it considering such an ordinance?

   f. How is the undeveloped land on the flood plain zoned?

   g. Are there any current proposals to utilize the undeveloped flood plains of your river for recreational, residential, commercial, or industrial development?

   h. What proposals seem wise or unwise in light of the hazards you have identified?

2. Draw on a map of your community the flood plains (50 year flood line) of the (name) River from (location) to (location) and record how each flood plain is developed.

3. Determine by interviews the points of view of land developers, community citizens, realtors, chamber of commerce officials, planning commission members, city council members, and students of your class regarding the future development of the flood plains of the (name) River from (location) to (location).

4. Based on the information collected, have the class formulate alternative solutions to the development (or preservation) of the flood plains on the (name) River from (location) to (location).

5. Draw a chart of the power structure (pressure groups, governmental committees, governmental policy makers) of your community regarding who influences (underline the influencers) and makes policy (circle the policy makers) on flood plain development zoning.

6. If the solution advocated by the class members is different from the point of view held by the planning commission and policy makers of your community, then develop and implement a plan of action (presentation to the appropriate authority, develop a fact sheet, publicize your position, etc.).

RESOURCES:

(Data should be provided regarding sources of additional information relevant to this topic for your area).

High School
Social Studies

Jo Burgess

INVESTIGATING TREES AND ORDINANCES IN THE COMMUNITY

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Identify the need for a street-tree planting program in the community.
2. Identify (number) sources for obtaining information concerning trees.
3. Identify (number) resource people capable of giving professional assistance concerning street-tree planting.
4. List (number) ways trees can benefit a community.
5. Identify (number) ecological factors influencing the selection of street-trees.
6. Identify (number) environmental factors influencing the selection of street-trees.
7. List (number) types of trees recommended for street-tree planting.
8. Create (number) illustrations depicting the effective use of street-trees in the community.
9. Design an appropriate street-tree planting plan for the community.
10. Identify existing laws and ordinanaces governing community beautification.
11. Identify (number) ways a tree planting ordinance can benefit a community.
12. Describe, in writing, the value of a tree planting committee.
13. Identify (number) responsibilities of a tree planting committee.
14. Identify (number) influential citizens in the community who are willing to help adopt a tree ordinance in the community.
15. List (number) provisions that should be included in a tree planting ordinance.
16. Describe, in writing, the procedure followed for adopting a tree ordinance in the community.
17. Identify the governmental structure in the community as it relates to tree resources.
18. Identify the appropriate committee responsible for approving ordinances in the community.

19. Describe in writing, the operation and responsibilities of the local planning commission.

20. Develop a plan of action for adopting a tree ordinance in the community.

ACTIVITIES:

1. Take a field trip in the community and survey the existing trees to determine the need for a street-tree planting program. Observe the following:
   a. Healthy trees that should be preserved
   b. Dead trees that should be removed
   c. Diseased trees that need attention
   d. Areas where new trees are needed

2. Make a street-tree map of your community and record the following information:
   a.--Location of various site factor--
     width of streets
     width of planting strips
     set back of buildings
     location of utilities
   b.--Location of survey facts--
     healthy trees that should be preserved
     dead trees that should be removed
     diseased trees that need attention
     areas where new trees are needed

3. Gather a variety of informational materials that will help you become informed concerning trees. Consider the following sources:

   a. Audubon Society
   b. Co-operative Extension Service
   c. Department of Natural Resources
   d. U.S. Department of Agriculture
   e. Others

4. Identify professional resource people who are knowledgeable concerning trees. Consider:

   a. Landscape plan
   b. Soil Conservationist
   c. County Extension Agent
   d. Habitat Biologist
   e. Others

5. Seek the help of these professionals and invite them to class to discuss the following topics concerning trees:

   a. Value of trees in the community
     Ex. shade, separation of cars and people, microclimate improvement, beauty, boundary, others.

5. (continued)

   b. Ecological factors influencing the selection of appropriate trees Ex. soil conditions, climatic conditions, moisture, light, etc.

   c. Environmental factors influencing the selection of appropriate trees - Ex. conflicts salt splash, pollution, limited space, heat, others.

   d. Recommended trees for street-tree planting Ex. Ginqko, Amer. Hornbeam, Norway Maple, Pin Oak, etc.

6. Design sketches illustrating the effective use of street-trees in the community.

7. Use these sketches to design an appropriate street-tree planting plan for your community. Consider:
   a. Location
      near a building
      near utilities
      in a planting strip
   b. Suitability —
      size
      shape
      growth pattern
      root system
   c. Variation of species
   d. Environmental factors
   e. Ecological factors
   f. Width of street
   g. Aesthetic value and others

8. Identify any existing laws and ordinances governing community beautification.

9. Evaluate your findings and determine how a tree planting ordinance might benefit your community. Consider:

   a. Care and protection needed for existing trees
   b. The tree planting plan you want to implement
   c. Proper planting of new sub-divisions

10. Organize a tree planting committee to serve as an action group for
    a. Implementing your street-tree planting plan
    b. Adopting a street-tree ordinance
    c. Enforcing the ordinance

11. Determine and carry out the responsibilities of the tree planting committee. Consider:
    a. Seeking assistance from influential citizens
    b. Circulating a petition as a means of gaining support for adopting a street-tree ordinance

11. (continued)

    c. Determine the provisions that should be included in a tree planting ordinance. Example:
        care and protection of existing trees
        insure new trees will be planted
        insure sub-divisions will be properly planted
        hiring of a trained individual as a tree warden
        insure public hearings when important trees must be cut
        set standards concerning (size, shape, variety, manner of planting, location, spacing, quality of stock used, care after planting, etc.)
        observance of regulations (enforcement)
        others (ex. economic)

12. Identify the power structure in the community and determine the appropriate committee responsible for approving ordinances in the community.

13. Attend a Planning Commission meeting to observe

    a. Observe the operational structure of the commission
    b. Determine the responsibilities of the commission
    c. Determine the part they play in influencing the adaption or rejection of ordinances

14. Based on the knowledge you have gained, develop a plan of action for adopting a tree ordinance in the community that will include your plan for implementing a street-tree planting program.

15. Present your plan to the appropriate individuals and committees for approval.

16. Upon approval, work with the appropriate groups to carry out the plan of action.

Lower Elementary Dolores Furesz

PLANNING PLAYGROUND IMPROVEMENT

BEHAVIORAL OBJECTIVES:

1. Explain uses of the playground.
2. List possible types of play activities that could take place on the playground.
3. Identify (number) problems that limit or endanger playground uses.
4. List (number) needs for the playground.
5. Suggest (number) alternatives one could use to enhance the recreational functions of the playground.
6. Plan (number) improvements on the existing playground of the school.
7. Describe a strategy to explain to the school community the need for playground improvements.
8. Carry out this informational strategy.

ACTIVITIES:

1. Identify the different ways that students play, both on the equipment and on the playground itself.
2. Make a list of the playground equipment and of the types of games played which need space only.
3. Relate a personal experience of problems that occur on the playground. Are these problems the result of inadequate room, lack of equipment or a danger inherent in certain equipment? Would more equipment solve the problem? Is there a need to change things (different scheduling, rearrangement of equipment?)
4. List the suggestions for playground improvement?
5. Discuss the possibility of added equipment. How will you decide what should be added? Where can you go to find out about playground equipment? Who will pay for it? Who will install it?

6. Prepare two alternative plans (rescheduling of recess time, rearrangement of equipment, perhaps) if new equipment cannot be acquired, or is not needed.

7. Enlist the aid of older students to help select equipment. Consider space and cost.

8. With the help of the older students draw a map of the playground indicating where the new equipment would be placed, and the location or relocation of present equipment.

9. Present the plan to a parent group (PTA, PTO, etc.) to gain approval for the project and financial support for the purchase of the equipment.

Lower Elementary

Betty Ebert

PARK PLANNING TO MEET THE NEEDS OF YOUNG PEOPLE

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Describe orally what is meant by a park, city park, state park, national park.
2. Locate parks on a state map.
3. Identify (number) uses of parks.
4. Describe orally the natural surroundings and equipment needed in a park to meet recreational desires.
5. Identify availability of present parks in the community.
6. Demonstrate increased understanding of effective planning of park location.
7. Identify who heads the park planning committee and (number) present concerns of his about parks in community.

ACTIVITIES:

1. Discuss with the students their interpretation of a park, a city park, a state park, a national park. Who owns the parks? Why do we have parks? Have we always had parks? Read WHO KNOWS OUR NATIONAL PARKS? pp. 38-39 in Nov. 1969 issue of RANGER RICK's to the students.
2. Cut out the parks from a state road map as they are located by the students. Give the cut out parks to the students. Hold the map up to the light so the students have a better understanding of the number and locations of parks in their state. One could also place pins showing the various state parks on a map. Where are most of them concentrated? Why? Do same exercise relating to community parks.
3. Draw pictures showing the student participating in his favorite activities at the park. List the activities in the order of the greatest participation, so the students can see the most popular uses of a park.

4. Visit a park to see if it meets their need. What do they like about the park? What don't they like about it? What do they want that is not in the park? Are there ways to get the things they would like in the park? Does any equipment pieces affect natural surroundings? How? How can one blend in natural surroundings and equipment to enhance the park?

5. Determine the most affective locations of parks to meet student needs by putting pieces of green felt on a large local map in absurd locations; ex. all the pieces in one corner, then around the edge, etc. Help the student to discover which park planning meets his needs and that park locations are important to serve his needs.

6. Identify who is in charge of park planning and invite him to class both to discuss park planning now and in the future and to answer questions asked by the students.

Middle Elementary

Richard D. Gwinn

INVESTIGATING RECREATIONAL OPPORTUNITIES OF THE FOURTH GRADE CLASS

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Define recreation in writing.
2. List (number) types of recreation available in the community.
3. List (number) favorite recreational activities of the class.
4. List (number) recreational activities that are desired but not available in the community.
5. Identify where they could carry out each desired activity.
6. Identify who is responsible for seeing to it that the activities desired are provided.
7. Identify what would be needed to carry out a proposed plan in terms of material and money.
8. Develop a strategy as a group to make one of the most popular recreational activities of the class available to the class.

ACTIVITIES:

1. Define recreation in your own words after thinking over at least two good sources of a definition.
    a. Check with a physical education teacher for a source of a definition.
    b. Check a library source.
    c. Who recreates?
2. What are the classes favorite activities? Which activities cannot be pursued? Why not?
3. Could a strategy be developed to obtain a desired recreational activity not present?
    a. Is there a place to carry it out?
    b. Are there facilities available?
    c. What is needed to make the facilities available?

  - d. Could someone volunteer adult supervision?
  - e. Could a fund raising help? How much money needed?
  - f. Can city or township officials be interviewed to establish whether they could help fulfill recreational experiences? Who are they? How can they help?

4. Develop a strategy to carry out the most popular recreational desires of the class. Make a presentation to the proper authorities the following facts:
   - a. The number of students that want to be involved.
   - b. Where it could be done.
   - c. Sources of supervision.
   - d. Total cost (include supervision, equipment or rent).
5. Carry out the plan.
6. Evaluate the strategy's effectiveness.

Middle Elementary

Emily Klopfenstein

PLANNING IMPROVEMENTS ON AN EXISTING SCHOOLGROUND

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Inventory existing playground equipment.
2. Analyze in writing the existing equipment listing the benefit of each.
3. Analyze in writing the problems and limitations of the equipment according to the ecology of the playground.
4. List (number) desired recreational pieces of playground equipment to add to the schoolground.
5. Explain in writing why these pieces are desired.
6. Prepare an oral presentation of the alternative choices of equipment.
7. Plan a method for conducting a survey of student opinion.
8. Present the results of the survey to school officials.
9. Implement the school officials response to the presentation and student survey.

ACTIVITIES:

1. List existing playground equipment under one of the three categories:
   a. team sport
   b. specific use of equipment (where several may participate individually but the use of the equipment is specific) such as swings or a slide.
   c. creative equipment such as monkey bars, concrete drain tiles.
2. Beside each piece of equipment list a benefit. Consider these questions: Does this equipment develop team cooperation, coordination, muscles, or creativity? Is the equipment fun?
3. Is the area level or hilly? Does it have good drainage? What is its size? Is some rearranging necessary? Will there be enough room to run freely?

4. Based on the inventory survey and the ecology of the schoolyard, what new equipment would be different or what equipment does the school need more of and what equipment suits the nature of the playground? Look at a recreational catalog for possibilities. Observe budget limitations, if any. Will the new equipment serve a purpose?

5. Identify desired equipment and list why it is needed, and why it would be beneficial.

6. Arrange for an oral presentation of this information to the students of the school. Use slides to illustrate the various types of equipment. Student opinion should be assessed concerning the proposals put forth in the presentation. Should every person be chosen or should representatives from each age group or class be chosen?

7. The survey should be carried out as completely as possible with results written up in such a way as to be the main feature of a presentation to the school officials and P.T.O. Benefits of the plan should demonstrate the planning and ecological considerations that have taken place.

8. If presentation and recommendations are acted upon, students should plan a way to carry out the necessary action then implement it. This might include fund raising, purchasing of desired equipment and actual construction or installation.

Upper Elementary

Raye Klopfenstein

A SURVEY OF POSSIBLE RECREATIONAL USES OF A GRAVEL PIT AREA

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, each student should be able to:

1. List (number) natural resources of the area.
2. List (number) possible recreational uses of the area.
3. List (number) ecologic or economic results of each of these uses listed in objective #2.
4. State the most urgent community recreational need.
5. State one recreational use of the area for each of the following age groups: children, teenagers, young adults, middle-age persons, retirees.
6. Describe what the owner of the potential site would want in exchange for use of the property (if any).
7. Describe the development and maintenance costs of each of the uses listed in objective #2.
8. Describe (number) sources of economic and political aid in initiating recreational use of the area.
9. Plan a presentation of facts and plans for use of the area.
10. Carry out plan.

ACTIVITIES: A visit to the gravel pit site.

1. Visit the site of the gravel pit. Is there water in the pit? What is the source of the water in the area? How pure is the water? What is the average depth of water? What organisms live in the water? Are any ecological problems in evidence? What plant and animal life live around the pond? What is the soil type? Is the area flat or hilly? Is access good? Is there an area suitable for parking?
2. Consider the recreational uses which various age groups would like to make of the area. Students interview parents, relatives, or friends. Do older, middle-aged, and young people all want the same recreational use? Could the site provide multiple uses for different age groups? What would each group prefer? Does it fit into the natural features present?
3. Consult a member of the local planning commission as to community recreation needs. What types of recreation are now available? Are the facilities adequate for the present population? For future growth? What type of recreation is most needed by the community? What types are completely lacking?

4. Consult a member of the local planning commission as to community recreational use. Will he sell or lease the land outright? If so, at what price? Does it matter to him what the site would be used for?

5. Each student makes a scale drawing or model of the potential site showing various plans for recreational use. Why does each student think his plan is good?

6. Compare the models to what is known about the resources of the proposed site. What effects would each of the ideas proposed in models have on the ecology of the site and the surrounding area? What would be the effects on the economy of the community?

7. Have a man from the maintenance department of a local park unit visit the class. As he views the model plans of the area, what maintenance problems would he foresee? Which recreational use would be most practical from a maintenance standpoint? What would be the approximate initial development costs of each of the possible recreational use plans?

8. Consult a local or state recreational administrator about finances. What government agencies or private groups might give financial aid for purchase or development? What can be done to bring the area to recreational use? How does one get the proper publicity?

9. Plan a strategy to present the students' findings and plans for recreational use of the site. What persons could put the plans into action? What persons are also trying to influence use of the site? Can other groups or individuals be teamed with to help provide the desired recreational uses?

10. Carry out the plan. How do you think this can be done to gain the most support and cooperation to insure the success of your plan?

Upper Elementary

Wilma Forry

INVESTIGATING DEVELOPMENT OF NEW RECREATIONAL AREAS IN OUR NEIGHBORHOOD

BEHAVIORAL OBJECTIVES

At the completion of a successful encounter, the student should be able to:

1. Label in writing on a large scale map of the neighborhood each of the (number) recreational areas.
2. Classify each recreational area based upon the type of recreation it provides.
3. Label in writing on the same large scale map of the neighborhood, each undeveloped parcel of land.
4. Identify and record, in order of preference, (number) types of recreation wanted by people of the neighborhood.
5. List (number) types of recreation most preferred on the survey which would be possible on some of the undeveloped parcels of land in the neighborhood.
6. Describe in writing the local recreation plan.
7. Identify (number) problems of the local recreation plan.
8. Identify who pays for recreation in the neighborhood.
9. Identify who is responsible for implementing the recreational plan.
10. Describe in writing (number) township ordinances concerning recreational areas.
11. Describe in writing a recreation plan for developing one of the undeveloped openland parcels of land and present it to the proper authorities.

ACTIVITIES:

1. Survey the neighborhood to locate the recreational areas and record their locations on the neighborhood map.
2. Visit each recreational area and prepare a written description of each.
   a. Is this a publicly or privately owned?
   b. How much acreage is there?
   c. Are activities directed or not-directed?
   d. What ages can participate or use the area?
   e. Is there a cost to use the area?
   f. What kinds of recreation are there?

3. Label in writing, on the same large scale map, each undeveloped parcel of land.

4. Survey by questionnaire and record in order of preference, ten types of recreation wanted by people of the neighborhood.
    a. What types of question will you ask?
    b. Which is the most common type of recreation desired?
    c. Do the present parks provide this recreation?
    d. Are there enough parks?
    e. Could a new park provide more of the desired recreation?

5. List three types of recreation that are both preferred by citizens and also possible to develop on the present undeveloped land.
    a. What does the survey reveal about citizen wants?
    b. What were suggested land uses as revealed in the encounter "Investigating Land Use in the Neighborhood"?
    c. Are there any ordinances that apply to land development for recreational purposes?
    d. Who would you ask about these ordinances?

6. Invite representatives from the county and township planning commissions to speak to the class on the topic of recreation.
    a. What is the plan for the township and the county?
    b. What is the projected need for recreation in this area?
    c. Are the plans for recreational areas adequate to meet those needs?
    d. If some types of recreational area are lacking, what are they?
    e. How are recreational areas purchased and who pays for them?
    f. Who pays for the operation of the areas?
    g. What are the ordinances dealing with recreation?

7. Make a recreational plan for one of the undeveloped parcels of land in your neighborhood.
    a. What kind of recreational area does the neighborhood need?
    b. Which of the undeveloped areas is available and would fit this need?
    c. What would the area and its development cost?
    d. Who would pay for this?
    e. Who has to approve of the plan?

8. Present the plan to the appropriate persons or agencies.

Junior High
Business

Leonard Thuemmel

INVESTIGATING THE POSSIBILITY OF DEVELOPING A SMALL NEIGHBORHOOD PARK

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Identify the major recreational interests of junior high youth in the neighborhood of the school.
2. Identify what parks and facilities are available in the neighborhood.
3. Identify what parks and facilities are needed in the neighborhood.
4. List 4 areas in the neighborhood that could be used for a park to meet the needs identified in behavioral objective number 3.
5. Identify the owners of the land.
6. List (number) of the major natural and artificial features of each area.
7. Describe in writing the distribution of ages in the neighborhood population.
8. Describe the physical and visual access to each potential park area.
9. List (number) different ways of purchasing the land from its owner.
10. List (number) different ways of obtaining funds for purchasing the land.
11. Identify (number) different ways of financing the development of the land.
12. Identify the people that would be responsible for the maintenance of the park after it is built.
13. Develop a plan of action to get a park developed.

ACTIVITIES:

1. Take a poll of junior high students to find out what they want in the way of recreation.

2. Take a survey of the area to find out what parks are presently available for recreation.

3. What parks and facilities are needed in the neighborhood?

    a. Is the population mostly retired, high school age, elementary or pre-school age?
    b. What are the main interests of the people in this area?

4. Plan a field trip to the subdivision for the purpose of finding available land to be used for a park.

5. Obtain a map of lots in the subdivision to see who owns the land and to find out if there are any restrictions on this property.

6. Obtain a topographic map of the area.

    a. What is the terrain of each area?
    b. Will drainage be a problem?

7. Have the students work in groups to map out the 4 areas.

    a. How many houses in each area?
    b. Are the roads good in each area?
    c. Will the roads take the added use?

8. Have the class draw a model of each of the 4 areas, (including the roads and terrain of the area).

9. Have one of the local real estate men come in to explain the ways of obtaining the land.

10. Have the students list different ways of paying for the land.

11. Have the students list different ways of paying for the building of the park.

12. Find out (or arrange for) who will maintain the park.

13. Arrange for the class to make a presentation before individuals and organizations that make and influence recreational policy.

Junior High
Business

Leonard Thuemmel

DEVELOPING A TEEN CENTER IN THE COMMUNITY

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Identify the need for a teen center in the community.
2. Identify a building that could be renovated into a teen center.
3. Identify who this teen center would serve.
4. List (number) activities which could be carried out in a teen center.
5. Design physical features within the teen center.
6. List equipment needed in the teen center.
7. List (number) sources of local promotional support for a teen center.
8. Identify (number) ways of financing a planned center.
9. Develop a plan of action to get the teen center started.

ACTIVITIES:

1. Take a survey of the students in the school.
    - a. Would you support a teen center?
    - b. What social activities should it have? (Dances, live band, snack room.)
    - c. What physical activities should it have? (Pool table, ping pong, cards, others).
    - d. Would you pay to attend this center? (Yearly membership, by event, other).
    - e. How and who should control this center?
    - f. What should the days and hours be that the center would be open?
2. Have a real estate person in to talk to the class about available buildings in the area and the possibility of using one of them.

3. Have a group discussion in class to draw up guidelines on what teens will be able to use the center.
    a. Students just from this school?
    b. Whoever buys a membership card?

4. Work in groups to draw up rules for the center covering the following:
    a. Drinking and/or smoking
    b. Age limit
    c. Should we have a teen governing board?
    d. If adults should help, what adults should help control the teen center? (Police, teacher, parent, member town council.)

5. Write to other towns that have a teen center and find out the types of activities they have and how they have the different parts of the building set up.

6. Draw up plans that could be used, listing what types of equipment would be needed.

7. Write letters and visit meetings for possible sources of local support in the area. (Parents, police, churches, school, town council.)

8. Find out what the cost of running a teen center would be and ways this money could be obtained.

9. Identify an individual or policy groups that would help regulate a teen center.

10. Work as a class and ask the student council for help to put this plan into action.

11. Present this plan to civic groups to help put the plan into action.

High School
Social Studies

Dorothy Conroy

INVESTIGATING A PARCEL OF LAND FOR RECREATIONAL USE

BEHAVIORAL OBJECTIVES:

At the end of a successful encounter, the student should be able to:

1. Draw on a map of the community the parcel of land in question, identifying any unusual physical or ecological features.
2. Describe in writing the history of the land use of the areas, bringing it up to the present time.
3. Describe in writing the existing laws governing the use of the land-zoning ordinances, state laws, etc.
4. Draw up a plan for recreational use of the land, and identify reasons for decisions.
5. Determine who influences land policy for area-government officials, realtors, etc.
6. Identify four points that must be considered and accounted for in implementing a land use plan for the area.
7. Describe the major actions (in writing) needed in order to have the desired recreational plan adopted.

ACTIVITIES:

1. Trip to the land area in question.
    a. Carry out site inventory-size, terrain, ground cover, water availability, soil type, unusual features.
    b. Take slides of area and features.
2. Obtain information regarding zoning laws and ownership of land from local government unit.
3. Determine who makes laws concerning zoning for area, and how much control residents have over these decisions.
4. Identify community interest groups and determine if their objectives are similar or opposite. Support might be gained by working with another group.
5. Obtain history of land and its use — library resources, local histories, interviews with long-term residents.

6. Determine regulation size of baseball diamonds, tennis courts, volley ball courts, swing and slide areas, and ice skating rinks to determine what could fit practically into space available.

7. Conduct survey of immediate neighborhood and other close residential areas to determine recreational needs.

8. Draw up plans of recreational development, including placement of trees, shrubs, etc.

9. Determine approximate cost of converting area to suitable recreation area.

10. Interview local government officials to determine who would be responsible for grounds upkeep, replacement if equipment, safety, and enforcement of any necessary regulations.

11. Present plans to local government for consideration.

12. Obtain backing of influential members of community to implement plans — fund raising campaign, voters' approval on bond issue — or both.

13. Obtain publicity in local papers to gain voters' approval and general public support.

High School
Social Studies

James Godo

EXPLORING RECREATIONAL NEEDS OF TWO-WHEELED MOTOR VEHICLE IN AND URBAN AREA

BEHAVIORAL OBJECTIVES:

1. Identify the need for recreational lands for two-wheeled vehicles in the local area.
2. Identify the present recreational use of lands in the local area for two-wheeled vehicles.
3. Determine who owns the land mentioned in behavioral objective 2.
4. Describe the community benefits of having such recreational areas.
5. Determine what conflicts of interest might arise where a land area is proposed for the use mentioned in behavioral objective number 2.
6. List the benefits of such a recreational area, not only to those who own 2 wheel motor vehicles, but to the general citizenry as well.
7; Identify laws and restrictions governing the use of motorcycles in the community and within the State.
8. Identify motorcycle organizations within the local community, the state and the nation which could assist in the development of the type of recreational lands mentioned in behavioral objective 1.
9. Identify the ecological effects of two-wheeled motor vehicles upon the land and surrounding area mentioned in the above behavioral objectives.
10. Prepare a plan for developing more land areas to be used by two wheel motor vehicles.

ACTIVITIES

1. Take a survey to determine who owns motorized cycles in your area.
    a. What are the age groups involved?
    b. What percentage of the cycle owners are involved in woods, trail and field riding. (So-called off the road riders.)
    c. How far must the off the road riders travel in order to find access areas for their cycles?
    d. What are the future implications involved? Is the trend toward owning motorized cycles? Approximately how many young people are there in your community who aren't of driving age yet?

2. Draw a map showing lands in the local area which are now being used by motorcycles.
    a. Are these areas legally designated as motorcycle riding areas?
    b. Who has access to the property?
    c. Is access to the property through public or private land?
3. Find out who owns and manages the land mentioned in behavioral objective number two.
    a. What was the intended use of the land originally?
    b. What are future plans for the area?
    c. Do the owners or managers ever make improvements or maintain the land?
4. Cite (number) ways that authorized motorcycle riding areas can benefit the entire community.
    a. Have motorcycles created problems in the community to date?
    b. Does the community have land which is vacant and desolate?
    c. Do motorcyclists legally have a place to go in the local area?
5. List (number) ways motorcycles conflict with other recreational pastimes.
    a. Who has the right to the land use?
    b. Can the cyclists legitimately justify use of the sites mentioned?
    c. Why are there so many conflicts with motorcycles in land use?
6. Prepare a pamphlet emphasizing the benefits of having motorcycle recreation areas in the local community.
7. Invite a policeman or some other authority to give a talk or presentation on laws governing motorcycles in the community and the state.
8. Write or contact local, state and national motorcycle organizations concerning the development of recreational motorcycle sites within the community.
    a. Are these organizations aware of the ecological aspects of motorcycling?
    b. What suggestions do the organizations offer in regard to developing such areas within the community?
    c. What are the advantages or disadvantages of having a local cycle organization.

9. Describe the effects of motorcycles on the environment.

   a. Do motorcycles disturb wildlife? If seasonal use was advocated could this be reduced?

   b. List ways in which motorcycles can harm the land?

   c. What do you think is the single most environmentally distrubing aspect of motorcycles?

   d. List (number) ways that environmental destruction due to motorcycles can be reduced.

10. Present to the proper land owners and community authorities, a plan for developing a site as a recreational area for motorcycles.

    a. Who would purchase or maintain the site?

    b. Where would the site be located?

    c. Does the site conflict with other land uses i.e., residential, school parks, etc.

    d. What is the ecological condition of the land mentioned?

    e. Will this parcel of land, be able to sustain all the motorcyclists in your area and if so for how long?

    f. Draw a map showing the proposed area, and its relation to surrounding land areas.

Lower Elementary

Dolores Furesz

INVESTIGATING WAYS FOR ENVIRONMENTAL ACTION ON THE SCHOOL SITE

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. List (number) natural ecological characteristics of the school site.
2. Identify (number) environmental problems on the school site.
3. Select one environmental problem and develop a plan for its improvement.
4. Identify the individuals (power structure) of the school who have the authority to permit change.
5. List (number) individuals who can suggest ways to improve conditions of the school site.
6. Describe the actions needed to have the plan adopted.

ACTIVITIES:

1. Walk around the school site. Take an oral inventory of its physical characteristics. (Is it rolling? flat? Are there any trees, drainage ditches, unusual features?) What is the extent of its use? What are the limitations? What do you like about the site? What don't you like? Why?
2. Look at a collection of slides showing environmental problems on various school sites. Which coincide with the problems on your site? What did those schools do about the problems? Could you do the same things? Why or why not?
3. Examine the school site again. Look for specific problems on the site. (Soil erosion on the playground or parking lot, dumping of trash on a part of the site, odors or residue from the school incinerator, use of the school site for riding motorcycles and mini-bikes, traffic problems). How do these problems affect the use of the site? Who is responsible for creating these problems?
4. Take a census among the students of your class. Which problem on your site disturbs you most? Why? What can you do about it? How far are you willing to go? Can you work together to help solve the problem?

5. Discuss how you can initiate a change or improvement on the site. Who do you express your concerns to? Who has to approve your plans? How do you involve these people? (Principal, teachers, student council, students.) Select a student to inform the principal of your area of concern. Ask permission to call in resource people concerning the problem.

6. Decide who are the people who can add solutions to the site problem, along with student's suggestions. Invite resource people to speak on the site problem, (i.e., environmental education consultant, police officer, Soil Conservation Agent, etc.). If the site problem is something that may involve a law violation or enforcement, invite the township supervisor or a police department official to discuss this with the class.

7. Formulate a plan to solve or improve the problem. Based on the information acquired from the resource people and from how other schools solved similar problems, decide what could be done about the problem at the school level.

8. Chart out the basic ideas of the plan. Develop alternative solutions. Invite the principal and student council to a presentation about the problem. Parent or citizen participation may be appropriate also.

9. Inform the student body of the plan, by way of a playlet, panel, readings, or a presentation of some form. What should be included in the information? (Define the problem, give alternate solutions, relate the plan of action, tell about the steps needed to implement the plan.

10. Seek publicity concerning the plan (school newspaper, local newspaper, posters).

11. Meet with the principal and/or student council to map out the strategy for implementation. Follow through with the plan of action.

12. Discuss some of the environmental problems that are found in the community. Where would you go for information and to present a plan of action? (township or city)

13. Look at the filmstrips "Environmental Crisis"* in the research center, which show problems on a regional and national scope. Where would you expect to seek remedies for state problems? For National problems? World problems?

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* See information on this filmstrip in pollution encounter.

Middle Elementary

Emily Klopfenstein

IMPROVEMENT OF THE MICROCLIMATE ON ONE'S SCHOOL SITE

BEHAVIORAL OBJECTIVES:

At the conclusion of a successful encounter, the student should be able to:

1. Draw a map of the school site.
2. Identify (number) climatic problems on the school site.
3. List possible solutions to each of these problems.
4. Describe the ecological rationale for each solution.
5. Design a plan to solve at least one of these climatic problems on the school site.
6. Carry out the plan for solution of these climatic problems.

ACTIVITIES:

1. After a short field trip around the school site ask the student to answer the following survey questions: From which direction does the wind blow? Are there any trees to reduce the wind? Where are those trees? Is the playground protected from the wind? Which rooms have the greatest exposure to the sun? Are there any trees to shade them? Is the school near a highway? Are there trees or shrubs planted so as to create a barrier against highway noise?
2. Draw a map of the school property. Indicate wind direction with arrows. Indicate existing trees and shrubs with different symbols.
3. Is the wind a problem? Does it cause discomfort? Does it cause the snow to drift in winter? Would a wind barrier save heating and fuel? Are the rooms facing the sun uncomfortable during the day? Is there disturbing noise from the road?
4. What could be planted to break the wind? Where should shade trees be planted? Where should plantings be placed to reduce road noise?
5. Choose the trees and area where they would be planted to reduce wind. Plan the location for shade trees. Plan the location for trees to shield highway noise. Using different symbols add the proposed trees and shrubs to the map of the site.

6. Present the plan to school officials, parents and students. List the problems. Describe alternative solutions giving a rationale for each. Volunteer to help organize a school work project to carry out the necessary plantings.

Middle Elementary Richard D. Gwinn

INVESTIGATING GROUP ACTIVITIES ON THE PLAY PAD OR ASPHALT AREAS

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the students should be able to:

1. Distinguish orally between conflicts that are caused by natural behavior of students and conflicts that are caused by their environment.
2. State in written form how environmental objects cause or aid the conflicting activities.
3. Draw to scale (1 in. to 10 f.) or (1/2 in. to 10 ft.) the play pad areas, including necessary physical features and the areas of conflicting activities.
4. Discuss verbally what they observed about the conflicts.
5. List two solutions to the conflicts and be able to defend them.
6. Select what they think as a class would be the best solution to the conflict.
7. Carry the best solution out, or see it through to its implementation.

ACTIVITIES:

1. By observation, record details of activities that are taking place before school , during school, after school and in the evening, in the format below:

Nature of Conflict induced by Environment	Nature of Conflict induced by Behavior	Time	Location	Activity	Ages of persons

2. A discussion lead by the teacher would have to be held before the students would understand objectives one and two. Repeated observations would be necessary.
    a. Would students throwing stones be induced by the environment?
    b. Would students throwing sticks and stones in puddles of water be induced by human behavior?
    c. Would student fights be the result of environment induced conflicts or human behavior induced conflicts?

3. Chalkboard lessons in Math would establish an understanding of scale drawing. A physical feature such as, puddles, bushes, and rocks should be included. Abstract figures could designate each activity on the outlined area of the play pad. If there is a conflict or overlapping of activities in a given area this area would be shaded.

4. Why are students attracted to certain landscape features such as water puddles, stones? Why are some areas not used? Where are the problem areas? What is the basic cause of these problems? What solutions to these problems could you suggest (remember what type of problem you are dealing with).

5. Groups could defend their view or solutions in order to help the class decide what they should actually do.
    a. To solve conflicts induced by the environment or to solve conflicts induced by human behavior. How would you solve an environmentally induced conflict? Could you remove it? Could you remodel it? How would this help remove natural behavior conflicts?
    b. What could be done in the unused area?
    c. What materials would you need for your solution? What would be the costs of the solution?
    d. What is the best solution which has been proposed?

6. What the class could do would depend on how motivated and concerned they actually are about the problem. Who could help you with your project? Who is responsible for improving the play pad.

7. Would your plan distract students from environmentally induced conflicts? How else would you plan to improve the play pad?

8. What is the best way to carry out your plan to improve the play pad?

Upper Elementary

Irene Muirhead

INVESTIGATING A MISMANGED AREA ON AN EXISTING SCHOOL SITE

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Describe in writing the history of the use of the school site area.
2. Describe in writing (number) of the natural features that should be considered in determining the particular use of the area.
3. Identify (number) of the problems that exist because of the present use plan.
4. Identify the individuals or groups of individuals that have the authority to determine the use of the area.
5. List (number) criteria that should be accounted for in determining a particular use of the area.
6. Write out a plan for the use of the area showing how it improves upon the existing use.
7. Describe in writing the major actions needed in order to have the desired area use plan adopted.

ACTIVITIES:

A walk in and around the area on the school site that is in question.

1. Carry out a site inventory of characteristics of the land. Is there water present? Does it appear frequently? Is the land on a slope or level? What kind of soil is there? What is its present use? Does the area appear to have been used for another purpose at some other time? How long has it been used for the present purpose? One group could research this question. Sources of information:

    a. Interview a teacher working in the building the longest.
    b. Interview older students who attended the school in the past.
    c. Interview a community resource person knowledgeable in this field.

    The group then reports back to the class on the collected data.

2. List the problems existing because of the present use of this area:

    a. Compatibility of use to natural characteristics.
    b. Compatibility of use to location of area (noise factor, traffic etc.).
    c. Cause for danger or accidents.
    d. Effect on surrounding activities now taking place.

3. Enumerate any present features you would not want to be destroyed.

4. Interview teachers and students throughout the building to obtain their attitudes about this area and its present use. Areas to investigate:

    a. Major concerns or complaints of present use.
    b. Suggestion of an alternate use for the area.

    Compile a list of these suggestions in order of degree of concern.

5. Obtain information regarding who has the authority to approve a new plan of use for the area.

    a. Meet with the principal to discuss the possibility of your class making a plan they think more beneficial than the present plan.
    b. Meet with other interested parties and record reason for their interest.

6. Based on collected information and suggestions, natural features, and the needs of the concerned persons, determine desired alternative uses for the area.

7. Design a plan including these alternative land uses. (This could be done by dividing into groups, each working on a particular plan of use.) Select a design the class feels is most satisfactory in fulfilling the needs and desires of the majority of the concerned people, taking into consideration the compatibility of use to the natural characteristics of the area.

8. List reasons for deciding on the design you did and give rational behind your reasons.

9. Choose an alternative plan and support with reasons why it could be used.

10. Present the design and plan to principal. This could be done through Student Council Representation or as a group representing not just your class but with support of any other interested persons as well.

11. Decide how the class can be most effectively involved in the carrying out of the plan.

12. Carry out the plan of action.

Upper Elementary

Wilma Forry

INVESTIGATING THE TRAFFIC PATTERNS OF THE SCHOOL PARKING LOT

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. List (number) types of pedestrian traffic occurring in the parking lot.
2. List (number) types of vehicular traffic occurring in the parking lot.
3. Make a diagram of the parking lot and show the present pedestrian and vehicular traffic patterns.
4. Describe in writing (number) conflicts between pedestrian and vehicular traffic patterns.
5. Identify what he believes is the best reason why conflicts should be reduced or eliminated.
6. Describe in writing a plan for eliminating or reducing the conflicts in the parking lot.
7. List (number) major steps of implementing your plan to "Improve the Traffic Flow in the School Parking Lot".

ACTIVITIES:

1. Initiate a class discussion about the traffic in the school parking lot.
    a. What kinds of traffic are there in the parking lot?
    b. Who are some of the pedestrians who have to walk there?
    c. Who are some of the drivers of vehicles that drive there?
    d. Have there ever been any accidents or near accidents in the parking lot?
    e. Do people and vehicles ever get in each others way?
    f. Do you think anything could be done to improve the traffic patterns?
2. Visit the parking lot to make a drawing of the lot and its traffic patterns.
    a. Where do the people walk when leaving their cars?
    b. Where do children walk when leaving the buses?
    c. Do children walking from home have to cross any part of the parking lot?
    d. Where do the buses drive?
    e. Where do the people coming to work drive and park?
    f. Where do parents bringing children to school drive?
3. Study the pedestrian and vehicular traffic patterns on the drawings of the parking lot.

3. (continued)

    a. Do the paths of pedestrians and vehicles cross?
    b. Could these crossings be possible accident scenes?
    c. Are these patterns more congested on days of bad weather?
    d. Do pedestrians watch for traffic as carefully during rainy weather?
    e. Would fewer crossings mean less chance of accidents?
    f. Would a parking lot with no crossings of pedestrian and vehicle traffic be an ideal situation?
    g. Is it possible to plan the traffic flow of the parking lot so that pedestrians and vehicles do not cross paths?

4. Each student make a plan for "Improving the Traffic Flow in the School Parking Lot".

    a. Can pedestrians from the parking lot take a route that will not cross vehicle traffic?
    b. Can vehicle traffic be rerouted so as not to conflict with pedestrians?
    c. Can the lane for pedestrians be marked so persons driving vehicles will know where to expect the walkers?
    d. Can the pedestrian lanes have a natural screen of shrubs or trees to keep out traffic sights and sounds?
    e. Should you try to also make the area attractive?

5. Students make a three dimensional model of the plan they believe to be the best and decide on the steps for implementation.

    a. Should the plan be presented to students, teachers and principal?
    b. Who will make the final decision?
    c. Who will do the work?
    d. How will the work be done?
    e. Who will pay for the materials?

6. Implement the plan if permission is granted.

Junior High
Science

William Veegaete

INVESTIGATING THE DEVELOPMENT OF A POND FOR THE SCHOOL SITE

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Draw and read topographical maps.
2. Construct a map depicting the various land structures.
3. Identify different soil types, the characteristics of each and the importance of this information in the development of an area.
4. Test percolation of an area and understand its importance in the development of an area especially for housing.
5. Identify the natural ecological characteristics of the land.
6. Identify the importance of these natural features for learning.
7. Identify the importance of specialized outside resource personnel in the development of such an area.
8. Write out a plan for the use of the area identifying rationale for one's decisions.
9. Choose the proper action which will best promote the importance of such an area and its value as an educational tool.

ACTIVITIES: Development of a Pond.

1. Make a topographical map of the area showing the contour of the land.
2. Make another map of the area designating the location of wood-lots, swamps and grasslands. On this map make special notations of any natural points of interest that should be saved if at all possible.
3. Using a ground bore dig down in various places throughout the proposed area. Keep accurate notations of the different soil layers and their depths.
4. Take samples of each layer and determine their types by running them through sieve screens.
5. Test the percolation of the soil in various places.

6. Take a series of photographic slides of the area and its features.
7. Using this information, decide with the students the best location for the pond.
8. With the help of the U.S. Soil Conservation Service lay down a blueprint for the pond designating the shape, depth, etc.
9. Plan some safety features that should be included such as docks, life savers, etc.
10. Check the cost of insurance for such an area and the exact coverage.
11. Make a scale model of what the completed area would look like including the pond, future tree plantings, nature trails, etc.
12. Obtain three estimates from different companies to determine the cost of the project.
13. Make a presentation of the proposed development to the student body and allow them to voice any suggestions and objections.
14. Submit the entire report to the principal, superintendent and school board members for approval.

Junior High
Social Studies

Paul Koenig

INVESTIGATING A SCHOOL SITE FOR LANDSCAPE DEVELOPMENT

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. List the physical features of the site to be developed.
2. Describe in writing a plan for landscaping the school site.
3. Draw a sketch incorporating the best features of plans that have been submitted.
4. List two problems that would hamper completion of the project.
5. Identify the individuals or groups who are responsible for the approval of the site development.
6. Develop a plan of action to facilitate the solution of one of the problems states in question #4.

ACTIVITIES:

1. Conduct a survey to determine soil condition and drainage. What natural features can be utilized to the best advantage?
2. Gather information from the Dept. of Agriculture bulletins and local soil conservation district to assist in layout and selection of plantings. Obtain price quitations from three nurseries.
3. Investigate three methods by which funds may be raised to finance the project.
4. Each class member will submit a drawing of the proposed landscaping. Selection of the four best drawings will be made by a designated committee.
5. Discuss two problems that might hinder the successful completion of the project.
    a. How would you counteract acts of vandalism?
    b. What conditions of soil or climate would be a barrier to success?
    c. Are there regulations which must be observed?
6. By inquiry find out who makes the final decisions concerning land site improvements. Do many people enter into this decision or is it a matter for the school board alone?

7. Investigate what has been done concerning similar projects in other communities.

8. Present plans and recommendations to those who will make the decision.

High School
Art

Jo Burgess

DESIGNING A SCHOOL SITE DEVELOPMENT PLAN

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Determine (number) justifications for developing a school site.
2. Identify (number) "key people" to serve on a site development committee.
3. List (number) types of resources available on the school site.
4. Identify the existing land use plan.
5. Describe, in writing, the desired use of the school site.
6. List (number) goals and objectives for the use and development of the school site.
7. Make (number) recommendations for developing the school site.
8. Identify (number) professional resource people capable of giving assistance concerning site development.
9. Develop a land use plan.
10. Develop a plan of action for developing the school site.
11. Identify the power structure of the school system.
12. Determine the appropriate individuals or committee responsible for making decisions concerning school site development.
13. Develop a plan of action for presenting the site development plan to the appropriate individuals or committee for approval.
14. Identify (number) individuals, committees, organizations willing to help implement the plan.

ACTIVITIES:

1. Identify several resource people knowledgeable in school site development, and invite them to class to discuss the justifications of school site development.
2. Design illustrations depicting the justifications of school site development. Example:
   a. Microclimate improvement
   b. Value of natural features
   c. Value to total school curriculum
   d. others.

3. Make plans to meet with a variety of "key people" and use your illustrations to point out the justifications of school site development. Consider:

    a. Influential school officials
    b. Influential community citizens
    c. Representatives of the student body
    d. Representatives of the faculty
    e. Others

4. Organize a site committee comprised of a variety of "key people". (Do not overlook the individual who attended your initial meeting) Consider:

    a. 4-6 staff members
    b. Administrative members: principal, school board member, other
    c. 4-6 students
    d. 4-6 parents
    e. Possibly others

5. Make an inventory of your school site to determine: the natural resources available on the site. Consider:

    a. Geological features (topography, soil types, etc.)
    b. Biological features (habitats, plants, animals, etc.)
    c. Water resources (open bodies of water, drainage pattern, etc.)
    d. Historical features (fence rows, other landmarks)

6. Make a map or a model of your school site showing:

    a. All the existinf resources
    b. Present land use plan
        1. natural areas
        2. parking areas
        3. recreational area
        4. other

7. Hold a site committee meeting to determine:

    a. Desired uses of the school site
    b. Goals and objectives for use and development of the school site

8. Use your inventory and map or model of the site to determine: (Use professional assistance as needed)

    a, Site features to be saved
    b. Features to be removed
    c. Features to be expanded
    d. New features to be dreated

9. Create illustrations depicting the recommendations for site development.

10. Use these illustrations in designing a land use plan. Consider:

    a. Natural areas
    b. Recreation areas
    c. Landscaping
    d. Others

11. Call upon the appropriate resource people for professional assistance concerning your proposed plan. Consider:

    a. Site Development Specialist
    b. Landscape Architect
    c. Soil Conservationist
    d. Habitat Biologist
    e. Other

12. Develop a plan of action for implementing your school site plan. (Consider a step-by-step plan for orderly development.)

    a. Priority
    b. Economic factor
    c. Scheduling of site development projects
    d. Others

13. Identify the power structure of the school system to determine the individuals or committee responsible for making decisions concerning site development.

14. Develop a plan of action for presenting your site development plan to the appropriate individuals or committees for approval.

15. Identify individuals, committees, organizations willing to help develop the school site. Consider:

    a. School
    b. Community
    c. Resource people
    d. Site committee
    e. Others

16. Upon approval, work with these people to implement your site development plan.

Lower Elementary

Gail Agne
Ellen Vande Visse

The Automobile and the Alternatives

Behavioral Objectives

At the completion of a successful encounter, the student should be able to:

1. Choose 15 pictures out of a set of 20 pictured objects which show a method of transportation and correctly name them orally.
2. Choose the automobile picture among the 15 transportation pictures as the main form of transportation in his/her community.
3. Name (orally) two reasons why the auto is an inefficient method of transportation.
4. Draw a picture of (or list) 3 modes of transportation which are less polluting (more efficient) than the auto.
5. Draw (or write) one means of transportation which he/she could use which is less polluting than an automobile.
6. Name (orally) two reasons why the method chosen is less polluting than the auto.

Activities

1. Discussion and classroom survey:
   - a. Introduce the term "transportation" and the various means of transportation used today (horse, airplane, train, rockets, boats, bicycles, etc.) through pictures and discussion.
   - b. What form of transportation does your mother, father, or guardian use to go to work, shopping, traveling?
   - c. Have the class draw or list these different kinds of transportation used and how many use each.
   - d. Why don't they use rockets, horses, or steamliners?
   - e. Does your family own a car? How many? What is the total number of autos for the classroom?
   - f. How do you get to and from school? List and total the results.

g. Which kind of transportation do you think most Americans use most often to go to work, shop, vacation?

h. What forms of transportation cause the most pollution? What kinds of pollution (air pollution, traffic jams, noise, use of energy, use of metal, etc.)?

i. What forms of transportation cause the least pollution?

j. What is meant by the word "efficient"? For example, how many children ride the school bus? How many cars would it take to carry that same amount of people? (One school bus engine does less work and uses less gasoline than several auto engines all working at once.)

2. Street Corner Survey:

a. Divide the class into small survey teams. Each team should have a parent or aide and a pencil and paper.

b. Have each team stand on a different street curb or corner near school and tally:

The number of autos	The number of autos carrying one person	The number of autos carrying more than one person

c. Have teams pool their totals on a chart in the room. How many cars had more than one person in them? How many had only one person per car?

3. Self-Assessment:

a. What other ways can you travel to and from school?

b. What is the best transportation method for you?
Which is the easiest?
Which is the most efficient?
Which causes the least pollution?
Which method would you be willing to try for 2 weeks?

4. For Further Discussion:

   a. What else can be done to make transportation to school more efficient?
      Fewer bus stops?
      Teacher car pools?
      Bike Trails?

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*Note to teacher:
vocabulary to be developed

transportation
efficient
inefficient
tally
pollution, air pollution
traffic, traffic jams
energy use

Middle Elementary J. Phillips

INVESTIGATING PEDESTRIAN PATTERNS TO AND FROM SCHOOL

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, a student should be able to:

1. Write a short paragraph explaining (number) problems which occur when students walk to school; briefly include possible solutions.
2. Design and carry out a survey of community opinion concerning this issue?
3. List (number) alternatives which could be used to resolve the issue.
4. Identify positive points of each alternative and decide on one as preferred.
5. Design a strategy for implementing the preferred decision with the aid of concerned parties.
6. Carry out the planned strategy for development of pedestrian patterns to and from school.

ACTIVITIES:

1. What problems are encountered by students walking to school? Would sidewalks alleviate the situation?
2. Take a walk in the neighborhood near school and discuss student transportation problems. Is there more than one? Why do they exist? Think of possible decisions.
3. Draw up a survey to determine the communities feelings and ideas concerning the traffic situation, possible solutions, and ways of implementation. Distribute surveys to all families involved in the school community.
4. Analuze the results of the survey. Does the community feel that there is a problem? What do they think are alternatives to the problems?
5. Develop and organize a presentation for township and school personnel. These are the people who handle the economic, planning and social aspects of the issue.

6. Meet with the proper township and school personnel. Present the results of your survey and analysis. Discuss with them various alternatives determined by the above activities.

7. Prepare a community presentation based on results of your meeting with school and township officials. Design charts, overlays and other visual aids to supplement the presentation.

8. Once the plan is approved, seek help from all concerned groups to implement the plan.

Upper Elementary

Raye Klopfenstein

INVESTIGATE THE DECAY OF RAILROAD PASSENGER SERVICE (COMMUTER)

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. List (number) advantages of railroad passenger service to the community.
2. List (number) advantages that railroad passenger service provides to individuals within the community.
3. List (number) community disadvantages of railroad passenger service.
4. List (number) disadvantages to individuals who use railroad transportation.
5. Describe the facilities, the upkeep of the facilities, and the amount of railroad commuter service in the metropolitan area.
6. List (number) of the railroads, noneconomic reasons for the present level of service.
7. List (number) reasons which commuters cite for the present services the railroad is providing.
8. List (number) cost factors of operation and maintenance of equipment for commuter service.
9. Compare the factors listed in objective #3 to (number) similar cost factors for local freight service.
10. List (number) improvements in equipment or service of the railroad which would encourage greater commuter use.
11. List (number) improvements in equipment of service of related transportational systems which would encourage greater use of the railroad.
12. Plan a strategy to inform railroad officials of suggested improvements in commuter service.

ACTIVITIES: A visit to the railroad station. Interviews with railroad officials and random commuters.

1. In a visit to a railroad station, interview 4 railroad officials and 4 commuters. Take complete written or tape recorded notes. Ask each person for their opinions on the following:
    - a. What advantages does the railroad offer the community?
    - b. What disadvantages does the community suffer because of the railroad?
    - c. What advantages does the railroad offer the individual?
    - d. What disadvantages are there to individuals who use railroad transportation?

2. Tour the station and take a ride on the train which a commuter might take each day to go to work. Observe carefully the services provided. What condition is the equipment in, clean, neat, sanitary? Are the comfort and health needs of the passenger provided for? Obtain a complete schedule of passenger services offered.

3. In an interview with a railroad public relations man, list the non-economic factors that he feels are determining the services and the conditions of the services that the railroad is offering.

4. Interview 3 random commuters as to why they feel the railroad is offering the services and schedules that they are offering presently.

5. If there is more than one railroad company providing commuter service in the metropolitan area, repeat each of the first four activities for each additional company. How do the companies compare in services offered--rationales for their services?

6. List cost factors (3) for commuter service and (3) for freight service as gained by reading and interviewing railroad experts. (officials or employees). Which service is more profitable for the railroad? What are the reasons? What would make commuter service more profitable? Is there a possible use of equipment for profit during non-commuting hours? Are new types of equipment available which would require less expense for maintenance?

7. In group discussion, consider ideas for improvement of equipment in design or quantity which would be beneficial to the railroad. How can the railroads cut costs yet provide good, attractive services?

8. In group discussion, consider ideas for improvement which would result in more use of the railroads by commuters. What do commuters want? What are they willing to pay? What promotional techniques would help "sell" the mass transit idea to car-driving workers?

9. Using the facts and ideas gained in the previous activities form a report which could be presented to railroad officials or interested groups.

10. Plan a method of presenting the report. How can it be used most effectively? Who wants the information? Who can act on the information? What railroad official(s) should receive a copy?

11. Present the report to the railroad officials and other interested parties decided upon in activity #10.

Junior High
Social Studies

Paul Koenig

INVESTIGATING A PROPOSED HIGHWAY PROGRAM

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter a student should be able to:

1. Describe in writing two reasons for the construction of intrastate highway (_______).
2. Draw a plan showing the projected route of intrastate highway (_______).
3. Draw a plan showing an alternate to intrastate highway (_______).
4. List three major problems which would affect the community as the result of the construction of intrastate highway (________).
5. Describe in writing two advantages that would accrue to the community as a result of the alternative you have identified in question #3.
6. Develop a plan of action to help establish the alternative identified in question #3 if you feel it is in the public interest.

ACTIVITIES:

1. Make a survey to determine the concentrations of auto and truck traffic on present roads that would be relieved by intrastate highway (_______).
2. From examination of the surrounding terrain decide what natural features of the landscape would be altered or destroyed by intrastate highway (_______).
3. What plans are suggested to preserve tree growth and prevent stream alteration? Will ponds resulting from excavation be a safety hazard?
4. Describe three problems which should be considered in relation to condemnation procedures and securing required easement for construction of the highway. What plans are suggested for proper drainage?
5. List three economic benefits which will result from the building of the intrastate highway.
6. Select a committee to identify one alternative to intrastate highway (______).
7. Draw a map showing the alternative to intrastate highway (_______).
8. Develop a plan of action to help establish the alternative identified in Behavioral Objective #3 if you feel it is in the public interest.
9. Work toward the implementation of your plan.

High School
Art

Jo Burgess

DESIGNING A COMPREHENSIVE TRAFFIC PLAN
TO AND FROM SCHOOL - AND - ON THE SCHOOL SITE

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Identify (number) modes of transportation used to and from school.
2. Identify (number) modes of traffic that exists on the school site.
3. Identify (number) existing traffic patterns on the school site.
4. Identify (number) existing traffic patterns that lead to and from school.
5. Identify (number) traffic problems that exist on the school site.
6. Identify (number) traffic problems that exist on the way to and from school.
7. Identify (number) resource people capable of giving professional assistance concerning traffic patterns and problems.
8. List the (number) major objectives of effective traffic pattern planning.
9. List (number) ways of effectively solving traffic problems on the school site.
10. List (number) ways of effectively solving traffic problems on the way to and from school.
11. List (number) ways an effective landscape plan can benefit the traffic patterns on the school site.
12. Identify the power structure within the school system.
13. Identify the appropriate individual or committee responsible for making decisions concerning traffic patterns on the school site.
14. Identify the local governmental structure within the community.
15. Identify the appropriate individual or committee responsible for making decisions concerning traffic patterns in the community.
16. Identify the laws & Restrictions that govern traffic patterns on the site and in the community.
17. List (number) major steps involved in an effective planning process.

18. Describe, in writing, an effective way of involving the school and community in planning and working together.

19. Develop an effective and aesthetic traffic plan to and from school and on the school site.

ACTIVITIES:

1. Develop a classroom discussion on the following topics:

    a. modes of transportation used to and from school
    b. modes of traffic that exist on the school site

2. Organize your class into two working groups to carry out the following surveys:

    a. GROUP A

        1. Survey the school site to determine the traffic patterns and problems that exist on the site.
        2. When determining problems consider:
            a. Access to:
                parking areas
                loading zones
                school building
                driveway
                others
            b. Walkways
            c. Bike paths
            d. Conflict of vehicles and people
            e. Others

    b. GROUP B

        1. Survey the surrounding community (within your school's boundary) to determine the traffic patterns and problems that exist on the way to and from school.

        2. When determining the problems consider:
            a. Congested travel routes during the school's opening and closing hours.
            b. Dangerous intersections
            c. Dangerous walkways
            d. Narrow roadways
            e. Poor visibility
            f. Others

3. In the classroom, share your findings with each other and record your information in a manner that will later help you develop more effective traffic patterns. Example:

a) GROUP A

TYPES OF TRAFFIC PATTERNS ON THE SCHOOL SITE	EXISTING PROBLEMS	ALTERNATIVE SOLUTIONS

b) GROUP B

TYPES OF TRAFFIC PATTERNS — TO AND FROM SCHOOL	EXISTING PROBLEMS	ALTERNATIVE SOLUTIONS

4. Identify several resource people who are knowledgeable concerning traffic patterns and problems. Consider the following:

   a. Traffic engineer
   b. School site developer
   c. Landscape Architect
   d. Local community planner
   e. Others

5. Invite these specialists into class to discuss:

   a. the objectives of effective traffic patterns
   b. ways of solving traffic problems
      1. on the school site
      2. to and from school

6. Divide your two original work groups into a number of smaller groups to further analyze the existing traffic patterns and problems. Example:

a) ON THE SCHOOL SITE

EXISTING PATTERNS		EXISTING PROBLEMS
GROUP A	Pedestrian	Conflict with vehicles
GROUP B	Automobile	Student-Staff parking
GROUP C	Bicycle	Conflict with cars and people
GROUP D	Bus	Congested loading zone area

b) TO AND FROM SCHOOL

SAME TYPE OF ORGANIZATION

7. Interview the student body, school administration (principal, teachers) and surrounding community citizens to determine their feelings and suggestions concerning:
   - a. Present traffic patterns
   - b. Existing traffic problems
   - c. Possible solutions

8. As a class, decide upon the goals and objectives you want to use as a basis for:
   - a. Solving the traffic problems that exist:
     1. on the way to and from school
     2. on the school site
   - b. Developing more effective traffic patterns:
     1. to and from school
     2. on the school site

9. In your small work groups determine the best possible alternative solutions based on:
   - a. What the people at school and in the community want
   - b. What seems right for the area under consideration
   - c. Suggestions from professional resource people
     Example - landscape architect - using landscaping as a means of effective traffic control
   - d. Your own research
   - e. Economic factor
   - f. Laws and restrictions governing school and community traffic patterns
   - g. Others

10. On the original chart, that was made, list the alternative solutions your group decides upon.

11. Make sketches to illustrate the effectiveness of your alternative solutions.

12. Using the sketches, design a model (with movable parts) of the school site and the surrounding community traffic patterns within the school's boundary) to show your traffic pattern plan.

13. Determine the power structure of your school system and identify the appropriate school officials to inform concerning your model and plan.

14. Determine the local governmental structure in the community and identify the appropriate community officials to inform concerning your model and plan.

15. Develop a plan of action for presenting your model and implementing your traffic pattern plans to the appropriate individuals, committees and organizations. Consider:

    a. Student body representatives
    b. Surrounding community citizen representatives
    c. Appropriate school officials
    d. Appropriate community officials

16. As a group, review all the possible alternatives concerning more effective traffic patterns on the school site and in the surrounding community.

17. As a group, make all necessary revisions and agree upon a final plan.

18. Present the plan agreed upon to the appropriate governmental and school officials for approval.

19. Upon approval, work with the necessary groups in order to put your plan into action.

Lower Elementary

Dolores Furesz

INVESTIGATING THE POND COMMUNITY

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Describe the pond community.
2. Explain simply the idea of a food chain.
3. List the three levels of a food chain in the pond community.
4. Identify what happens to the total pond community when one of its parts is altered.
5. List (number) ways man is affecting the pond's ecosystem.
6. Develop a plan of action to help resolve one of the problem areas.
7. Implement the plan of action developed in objective #6.

ACTIVITIES:

1. Visit a pond. Take samples of water bottom, water, plants, fish and other living organisms.
2. Assemble a sealed world for the class to observe. The sealed world demonstrates the interdependence of plants and animals and their relationship to the non-living world. It also demonstrates the cycles of photosynthesis, respiration and food chains.

   To make a sealed world one needs:

   One gallon jar, with sand or gravel in the bottom; pond water to within one inch of lip of jar; 4 or 5 small plants, one or two small fish, one or two snails. Screw cap on and seal with paraffin. Place jar where it will get light, but not direct sunlight.
3. Show slides which illustrate the variety of plant and animal life found in ponds.
4. Draw a picture depicting the food chain. Why is this important to a pond? What might happen if a part of the chain is removed or disappears?

5. Draw a picture to show the three levels of a food chain.
    a. Producers (plants)
    b. Consumers (fish, crustaceans)
    c. Decomposers (bacteria, fungi)

6. Draw a series of pictures showing what happens when:
    a. Sunlight is reduced. (No plant growth; no oxygen produced, which is needed by all living things found in the water.)
    b. Plants are reduced or removed. (Reduction or elimination of source of oxygen to the living things in the pond.)
    c. Plant eaters are reduced or removed. (Plant growth goes unchecked, profuse growth affects oxygen levels at night, which many fish cannot tolerate.)
    d. Soil is disturbed in some way. (Water becomes turbid, does not allow the same penetration of sunlight as before, reducing production of oxygen by plants; silt covers up fish eggs and other living things along the bottom: affects the gills of fish.)
    e. Bacteria is reduced. (Dead plants and animals would not be reduced to the nutrients and chemicals necessary to support plant growth; odor; a much more rapid filling in of the pond.)

7. Describe ways the ponds can be altered by "outside" forces: people living, working or recreating in the pond's immediate area. How do they change the characteristics of ponds? Could this have a negative effect on man's use of ponds? How?

8. Develop a presentation for each problem area on ways we can help resolve the problem. Invite parents and concerned citizens to hear the presentations and attempt through these presentations to generate an interest in adults to form an action group to work on these problems.

Lower Elementary

Pat Sarner

INVESTIGATING WATER POLLUTION AS EVERYONE'S PROBLEM

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Define water pollution.
2. Describe (number) ways water is polluted by people.
3. Describe (number) reasons why it is important for each of us to do his part in preventing pollution.
4. Draw (number) ways that you use unpolluted water, at home, at play, and on vacation.
5. Identify (number) types of pollution in (name) River.

ACTIVITIES:

1. Teacher preparations: Fill a small aquarium half full of fresh water prior to the beginning of the school day. Then:
   - a. Place where it is easily accessible to the students (do not refer to it).
   - b. Gradually add pollutants found around the school, left-over milk, paper, dirt, grass, etc.
   - c. As the material begins to fill the container and becomes odorous after several days, the children will naturally become curious about it as they watch the changes.
2. Discussion:
   - a. Discuss the changes they have observed taking place.
   - b. What do you think caused the changes?
   - c. Have you ever thrown one or more of these pollutants into a body of water?
   - d. Do you think that what you threw in made any difference in the freshness of the water, especially since there was so much water?
3. Let's pretend this jar of water is a lake, and this drop of ink, (or clothes bluing) is a pollutant that I just threw into the lake.
   - a. Did this one drop change the color of the "lake" much?
   - b. Now each of you put in a drop of "pollutant" into our lake -- is the color much different now?
   - c. Do you think you would like to swim in our lake now?
   - d. Since each of us put in only one drop of pollutant why is our lake so polluted?
   - e. Why is it important for each of us not be a water polluter?

4. Think of some of the ways we use fresh water. The first two rows of students draw ways we use fresh water at home. The second two rows draw how we use fresh water at play, and the last two rows, how we use it during our vacation.

5. Display and discuss each category.

6. Tour the (name) River and identify different types of water pollution. Before leaving the (Name) River help reduce one type of pollution (such as removing paper and cans).

Lower Elementary

Loraine Turcotte

INVESTIGATING WHAT WATER DOES TO SCHOOLYARD AND WHERE IT GOES

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Identify how and explain why water moves off the playground or school area.
2. Identify how different surfaces determine a water's course.
3. Describe how water can wear away or "cut" into soil and make a path in running off to other places.
4. Speculate where this water eventually goes and what it does with the dirt it takes with it.

ACTIVITIES:

1. A walk around a schoolyard after a rain. Do you see puddles? Where? Do you see big and little puddles? Are the big puddles on higher land, lower land? Where is the water running from? or to? Why does water go down hill? Do you see ruts in the dirt? Where did the soil go that used to be in the ruts? Are similar ruts in grassy area? Why not?
2. Take an empty #10 tin can - cut out at both ends. Have students move to "black top" area of playground. Place can over this type of surface and have them pour water into containers. Where did the water go? Repeat experiment in a sandy area and in a grassy area. What happened to the water in each case? Why?
3. Go to "black top" area of playground. Have students observe what happened to the water once it ran into the soil from the black top. Have students discover other such run-offs. Is there more surface run-off from the black top than from similar areas of grass?
4. Set up a model of a drainage situation like that observed. By use of sand or dirt have students create terrain and then pour water on the model. Where is the water going? What is it doing to the dirt or sand? How can you prevent the dirt or sand from washing away?
5. If there is a heavy run off of water from the school year investigate where this flow of water is going. Does it go into a brook or into the ground? Where does the brook go? Where does the water in the ground go?

   (A carry over into the subjects of underground water and springs could be another encounter.)

Middle Elementary

Richard D. Gwinn

INVESTIGATING QUALITIES OF THE HOME DRINKING WATER OF THE STUDENTS

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. State in writing the source of their drinking water.
2. Show by a diagram or a chart the chemical composition of water.
3. Write an essay on the local water history.
4. State (number) reasons why health standards are set for drinking water in the community.
5. Locate (number) sources of contamination.
6. List (number) potential sources of contamination.
7. Develop strategy to solve water contamination problems if any.
8. State the type of action they could engage in to carry out behavioral objective number 7.

ACTIVITIES:

1. Discuss with parents and determine the source of their drinking water.
   a. Is your source of water a well? How deep is it?
   b. Do a bar graph of each well's depth.
2. Do research in the library to find the chemical composition of water. What are the two most common chemicals? What proportion are they? Are there any other chemicals in water? What are they?
3. Have a nurse discuss the hygenic purpose of drinking water that is acceptable by the health department.
   a. Why do travelers in Europe drink mineral or carbonated water?
   b. Does this mean that the water of European countries is not good water?
   c. Why in some instances are pregnant mothers directed by their doctor to drink distilled water?
   d. What does the health department look for in the water to see if it is good for drinking?

4. Do research on the history of health problems of the area pertaining to drinking water by talking to a health department official and possibly talking to senior citizens of the area.
    a. When did the county health department start checking drinking water?
    b. Why was there a need for checking water?
    c. Were there any epidemics as a result of contaminated drinking water? .
    d. Could a visit to the grave yard prove that there were epidemics? How could this be determined?
    e. What scientists have helped man prevent such happenings? How did they present epidemics from occurring due to drinking water?

5. Because of the various sources of drinking water in the area a definition and/or diagram of the various sources of water would be beneficial to understanding the history and problems of drinking water of the area.
    a. What other sources of water are there?
    b. Which is the most common?

6. The students should take samples of drinking water in clean containers to be checked by the health department.
    a. Do any of the samples have poor quality?
    b. How can they be improved for drinking?

7. What is contaminated water? Where in the neighborhood could it become contaminated? Where is it becoming contaminated?

8. Discuss solutions and apply recommended action by a health department to solve their water contamination problems if any are found.

9. Make a display showing the ingredients in their water other than the chemical composition of water itself.

10. How could you prevent contamination of drinking water? If there is no problem now, how would you see to it that there is none in the future? What sort of action would this require? Would you inform your classmates of what you have found?

11. Develop a plan to solve water contamination problems in the community.

Middle Elementary

Emily Klopfenstein

STUDY OF THE MOSQUITO

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Describe and draw the life cycle of the mosquito.
2. Define desirable and undesirable habitat for the mosquito.
3. Describe what occurs when an insect attempts to draw blood from a warm blooded animal.
4. List the predators of the mosquito at the larva stage and at the adult stage.
5. List five ways man can control the mosquito population.
6. Describe how such controls might affect other aspects of the environment.
7. Identify a plan for limiting use of an ecologically harmful mosquito control.
8. Carry out publicity in plan to limit use of an ecologically harmful mosquito control.

ACTIVITIES:

1. Seek information in reference books on the life of a mosquito. Does the pond contain mosquito eggs or larvae? Collect a specimen of each stage and chart the life cycle. What is favorable habitat for the mosquito?
2. Discuss different aspects of the mosquito allowing the students to consider why we dislike the mosquito, if it serves any purpose, if we should try to destroy it, etc. Become informed in what occurs when a mosquito bites you. Try to trap some and see if they are male or female. Bring in information about disease bearing mosquitoes in some countries (malaria, typhoid). In general, gather information on the mosquito and why it is considered a problem.
3. Seek out information concerning the natural predators of the mosquito. What birds are there? Are the birds which prey upon them found near the pond? How can they be attracted to the site? What welfare factors are needed? Plan a way man can help institute these plans, build and locate birdhouses, for example. Are fish which are mosquito larvae eaters present? If not, can they be brought to the site?

4. Survey the methods people around the pond used to control mosquitoes. Chemical and biological means should be listed. Compare these methods learned through research as to effectiveness and impact on environment.

5. From the information which has been gathered, work out the results of each control in a hypothetical way. For each control decide if it is effective or if other problems will develop which would be worse.

6. If more controls are identified as harmful to the environment, plan a workable strategy to attempt to limit its popularity and use in ones community. How could students work with concerned agencies? Who are the stores responsible for the sale of this control? Can we ask them to stop selling it? What neighbors in the community use these controls?

7. Who is carrying out a plan of collecting and disposing harmful chemicals? Could the activity be carried out locally? Identify individuals who might help initiate such an activity. Volunteer to publicize the activity for them.

Upper Elementary Carl Landt

INVESTIGATING OIL POLLUTION IN THE COMMUNITY

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. List (number) needs which are supplied by water.
2. Describe in writing (number) ways the ecological system is altered by oil pollution.
3. List (number) effects, other than ecological, to a community whose water is polluted by oil.
4. List (number) sources of oil pollution in his neighborhood.
5. Describe in writing the major steps for a plan of action to reduce oil pollution in the community.

ACTIVITIES: Discuss the properties and necessities supplied by water:

1. Why do we need water? Why must water be safe? How long could we live without water? Are animals and plants dependent upon water?
2. Obtain an aquarium. Place within the aquarium a number of aquatic plants and two gold fish. Place the aquarium by a window. Then pour oil into the aquarium: How does the oil affect the vegetation? Can sunlight reach the plants? What will happen to the water? How will the fish be affected? How will animals that drink from oil polluted water be affected. How does all this affect man?
3. Have students research about oil pollution in other areas of the country. What were the results to animal life and vegetation? Are there other problems associated with oil pollution besides to the ecological system? What are they?
4. Investigate sources of oil in the community: Where does the oil come from which gets into the water? Does oil leak from cars? How? Find some traces of oil spots in driveways and parking areas. What happens to the oil when it rains? What other sources of oil pollution can you find in your neighborhood?
5. Having located the major areas in the community which contribute to the oil pollution of the water, determine the following:
    a. How could they cut down on the polluting?
    b. What can you do as a class?
    c. What can you do as an individual?

    (Suggested plan of action: prepare a fact sheet on the sources and effects of oil pollution in the community and distribute this fact sheet)

Upper Elementary

Raye Klopfenstein

INVESTIGATING SEPTIC SYSTEMS

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Describe in writing the history of human waste disposal in the last 100 years.
2. List 3 techniques of sewage disposal which have been used in the last 100 years.
3. Identify one advantage and one disadvantage for each of the listed techniques in No. 2.
4. Describe in writing how an efficient septic disposal system functions.
5. List 3 effects septic systems can have on the ecological system.
6. Describe 3 neighborhood ecological conditions as related to its method of sewage disposal.
7. Identify 3 individuals or groups of individuals who have authority to control placement and/or maintenance of septic systems.
8. List 3 local (township, city, or county) laws regulating septic disposal systems.
9. Describe an accurate test of septic system efficiency.
10. Demonstrate proficiency in performing the test described in objective number 7.
11. Plan a neighborhood septic information service.
12. Implement a neighborhood septic testing service.

ACTIVITIES: A visit to a home with a septic system.
A visit to an installation site of a septic system.
A visit to the classroom or above site by an expert on septic systems.

1. Examine the history (last 100 years) of disposal of human waste. What techniques have been used in the past? What are the advantages (economic and ecological) of each of these techniques?

2. If possible, witness the installation of a septic system. What happens biologically in a septic system? What happens mechanically? What are the components necessary to the system? What are the characteristics of a system operating at peak efficiency? What are the characteristics of a poorly functioning system? What soil and water conditions are most conducive to installation of an efficient septic system?

3. What are the effects of septic systems on ground water? How do soil types influence the effect on water? What happens to the soil itself? What are the effects on organisms living in the soil? What are the effects on the general ecological system?

4. Investigate the neighborhood situation. How many homes are using septic systems? Are the systems capable of handling the capacity they are being required to handle? Are any of the effects listed in number 3 in evidence? Would homeowners accept a different type of disposal system if it was proven to be needed?

5. Who controls the installation and maintenance of septic systems? Ask the local public health department. Is the control by state, county, township or city? What individual or group of individuals set the legal policies? Who enforces the legal policies?

6. Visit the local department of public health. (Or invite an official of the department to visit the class.) What laws are there to control septic systems? What penalties do the laws carry? Are there any new or more strict regulations which would be helpful ecologically? Do the costs of a sewer sewer system (e.g. Detroit's) outweigh the disadvantages of septic systems?

7. What tests can be made to show the condition of a septic system? What materials are necessary to perform such tests? Is digging necessary? Would fifth grade students be able to use these tests? Which test(s) are conclusive, yet easy to perform? Select the best test(s) for student use.

8. Plan a neighborhood septic testing service to be carried out by students on request of homeowners. How would this be organized? Who would be responsible for carrying out the tests?

9. Plan a strategy to inform neighborhood homeowners of the study results and testing skills available.

10. Carry out information and testing services.

Junior High
Social Studies

Leonard Thuemmel

INVESTIGATING THE SEWAGE TREATMENT PROBLEM

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. List 3 major problems associated with the local sewage treatment plant.
2. List 3 major problems associated with septic tank units.
3. Compare the operation of a sewage treatment plant to that of a septic tank unit.
4. List the regulations of a sewage treatment plant for a municipality, town, county, and state.
5. Diagram the local sewage treatment plant and briefly describe how it treats sewage at each stage.
6. Describe a more efficient sewage treatment plant that could be used.
7. List alternative solution to one of the sewage treatment problems noted in behavioral objective one and two.
8. Identify civic authorities who are responsible for proper sewage treatment in the area.
9. Identify (number) different ways of financing an improved sewage treatment plant.
10. Develop a plan of action to help solve one of the problems identified in behavioral objective number one.

ACTIVITIES:

1. Plan a field trip to the local sewage treatment plant to find out how sewage is broken down and put back into the environment.
   - a. What are some of the problems of this plant?
   - b. How does this plant work?
   - c. How complete is the treatment?
   - d. Where does the effluent go?
2. Show slides of outside problems and explain how some of the homeowners treat their sewage. Explain the operation of a sewage field.

3. Examine the regulations at the municipality, township, county, and state levels..

   a. List the regulations that pertain to the sewage treatment system that relates to the home of each student.

   b. List the advantage and disadvantages of the different regulations to the students.

4. Use local resource people to talk on the functions of different sewage treatments that can be used -- primary, secondary, tertiary, other.

   a. What is a sewage field?

   b. How is sewage put back into the environment?

5. Work in groups to draw up a few different ways of treating sewage. (What improvements would this make to our environment?)

6. Interview those parties in the area who are responsible for sewage treatment problems. Find out if they are working for improvements.

7. List different ways of paying for improvements that may be needed and figure out the cost to the people for these improvements.

8. Develop a plan of action to resolve one of the problems of the sewage treatment plant.

   a. Write letters to the local civic people that are involved in treating sewage.

   b. Write to the local paper pushing for action to let the people know what is needed.

9. Execute the plan of action.

Junior High
Science

William Veegaete

INVESTIGATING MERCURY POLLUTION

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter the student should be able to:

1. Identify (number) major water pollution problems.

2. Describe in writing (number) ways that pollution from one community can affect another community.

3. Develop a plan for testing the effects of mercury on an organism.

4. Identify (number) mercury poisoning symptoms.

5. List (number) economic results of mercury pollution.

6. Identify the power structure which governs the controls that are set up to regulate and cut down on the amounts of pollution that are taking place throughout the state.

ACTIVITIES: Investigating mercury poisoning in a laboratory

1. What has recently happened in the Detroit area which has made everyone conscious of the need for strict water pollution controls.

2. Find out where this mercury came from. If the mercury was dumped into the water at Port Huron how did the fish in the Detroit area, which is located some sixty miles to the south, become contaminated? Why was the southern part of Lake Huron also banned from fishing?

3. What effect does mercury have on a living organism? Go to the library for more information on this subject or write to some outside resources for more information.

4. Set up two large aquariums each containing the same size and species of fish. Obtain some mercury treated seeds from a local store. Feed the fish in one of the aquariums fresh hamburger but embed some of the mercury treated seeds in it. Repeat this daily for an extended period of time. (Do not continue the experiment beyond the point that you notice symptoms of physical disorders).

5. What do you suspect will happen to the fish that are fed the mercury treated seeds? How are birds affected, such as pheasants, that eat these seeds right after they are planted by farmers?

6. Find out some of the economic consequences that have resulted from this problem in your state.

7. Develop a plan of action to resolve one of the problems indicated by your findings.

8. Submit your plan to the entire student body and allow them to make any suggestions or objections. Alter the plan if necessary. Have the students vote on the plan.

9. Present the proposal to the chosen target agency: the Dept. of Natural Resources, an industry, City Commission, or other appropriate target.

High School
Art

Jo Burgess

DESIGNING & CONSTRUCTING A GARDEN POOL ON A SCHOOL SITE

BEHAVIORAL OBJECTIVES:

At the completion of a successful encounter, the student should be able to:

1. Describe (number) ways of constructing a garden pool on a school site.
2. Determine the physical conditions necessary for developing a natural garden pool.
3. Describe (number) ways of supplying a garden pool with water.
4. Identify the local building and/or sanitary code requirements concerning garden pools.
5. Describe (number) new environments a pool brings to a garden area.
6. Identify (number) types of plants that will grow in and around the pool.
7. Determine the conditions necessary for keeping fish in the pool.
8. Identify (number) ways of obtaining fish fro the pool.
9. Identify (number) types of fish that could live in the pool.
10. Identify (number) ways of managing a garden pool to control algae.
11. Identify particular individuals who might assist with the pool construction.
12. Design a garden pool that will support both fish and plant life.

ACTIVITIES:

1. Secure as much information as possible on how to construct garden pools.
2. Interview the local Soil Conservationist to determine the necessary conditions for constructing a natural garden pool.
3. Determine the purpose or purposes the pool is to serve, and, with the help of various resource people decide upon:
   a. The type of pool that will best meet your needs.
   b. The best location for the pool (soil test).
   c. The source of water to supply the pond.

4. Interview the proper officials concerning local building, sanitary and safety laws.

5. Draw a mural depicting the major new environments created by a garden pool.

6. Label the various plants found in each of the newly created environments.

7. With the help of a fish biologist determine:
    a. the necessary conditions for keeping fish in a pool.
    b. the types of fish that would live in that particular size pool.
    c. the best way to obtain fish for the pool.
    d. how to maintain a balanced aquatic community in the pool.
    e. how to control algae.

8. Design a garden pool that will provide the proper habitat for both the fish and the plants.

9. Determine the cost of the project and develop a plan of action for financing the project.

10. Develop a plan of action for implementing the garden pool project.

11. Identify the people who will make the final decision concerning the garden pool.

12. Design a plan of action for presenting the project to these particular people.

13. Decide what people are to be involved in inplementing the project.

14. Upon approval, carry out your project plan.

High School
Science

James Godo

INVESTIGATING ECOLOGICAL RELATIONSHIPS OF PROTOZOANS FOUND IN A SMALL LAKE OR POND

BEHAVIORAL OBJECTIVES:

At the end of the successful encounter, the student should be able to:

1. Identify (number) different species of protozoa.
2. Construct a graph to illustrate population changes among protozoa both in the laboratory and in the field.
3. Compare and contrast the numbers and kinds of protozoans found in different parts of the aquatic area.
4. Determine whether the study area is relatively sterile or fertile (oligotrophic vs Eutrophic).
5. Describe in writing ecological succession among protozoa.
6. Draw a food chain showing where protozoa fit in among the other animals in the pond or lake community.
7. Prepare a topographic map showing the relationship to depth and contour of the study area to protozoan numbers and variety.
8. Identify (number) environmental problems associated with the study areas and describe how each problem effects protozoans.
9. Develop a plan of action to solve one of the environmental problems associated with the study area.

ACTIVITIES:

1. Using small jars, collect small samples of mud and other debris from the study area. Also, collect water from different strata, i.e., surface, middle and near bottom.
    a. Label samples as to their origin.
    b. Examine the samples with the microscopes in the lab.
    c. With the aid of texts and manuals identify as many species as you can.
        1. How can you begin to group protozoa?
        2. Do numbers and varieties of protozoa seem to be related to different water strata.

2. Prepare graphs showing protozoan-population growth curves
    - a. What is the relationship of population growth to oxygen levels?
    - b. Do protozoan populations increase or decrease during certain hours of the day and night?
    - c. What are some other factors which seem to limit or speed up the growth of protozoan cultures.

3. Identify kinds and numbers of protozoa within certain ecological niches of the study area.
    - a. What if any, are the relationships of protozoa to water turbidity?
    - b. Why are some protozoa attracted to certain ecological niches?
    - c. Why do you suppose some areas of the study area have little or no protozoa?

4. Draw a chart comparing and contrasting an oligothophic body of water with an eutrophic body of water.
    - a. Take water samples and using the Hack chemical kit analyze to determine dissolve oxygen content.
    - b. Using the Hack kit, analyze water samples from the local area as to nutrient content.
    - c. Using the same equipment, sample the Ph of the water in the study area.
    - d. What is the color of the water in the study area?
    - e. Make a depth chart of the study area.
    - f. What is the bottom of the study area like? Is it uniform?
    - g. Using the above information, and the knowledge you have gained, decide if the study area is eutrophic or oligotrophic.

5. Observe and identify ecological succession in the laboratory.
    - a. Plot a graph to show the hourly or daily rate of succession of certain protozoan cultures.
    - b. What seems to be the determining factors of succession in the laboratory? Can this be applied to field conditions?

6. Illustrate how protozoa fit into an aquatic food chain.
    - a. Are protozoa consumers, producers, or reducers?
    - b. What are some factors which might disrupt protozoan population thereby effecting the food chain.

7. Using appropriate measuring devices chart the depth of the study area.
    a. Is the depth uniform or erratic?
    b. Is the study area natural or man made?
    c. What is the water source for this body of water?

8. List some problems associated with the body of water studied and show how such problems relate to the protozoa therein.
    a. What is the land used for surrounding the study area?
    b. What type of soil surrounds the area, and what type of ground cover does it have?
    c. Are there residential homes or industry in the immediate vicinity of the study area?

    d. Can you discern any artificial drainage into the study area.

9. Prepare a list of who uses the study area (pond or lake community) and what the uses are.
    a. Is the study area visited frequently? If so, what is it used for mostly?
    b. If the study area is not widely used what are the reasons?

10. Determine who owns the property surrounding the study area.
    a. Is the land private or public?
    b. What are the uses designated by the owners?
    c. What are the future plans of the owners in regard to maintenance or development of the study area?
    d. Submit to the proper authorities your evidence regarding the condition of the study area.
    e. Present your recommendations to them regarding preservation and improvement of the study area.
    f. List (number) ways you and your fellow students can act directly toward preserving and maintaining the aquatic areas studied.

SECTION VI

ENVIRONMENTAL EDUCATION
RESOURCE MATERIALS

Section VI

Environmental Education Resource Materials

Following are lists of Environmental Education Resource Materials that may be helpful to teachers in integrating Environmental Education activities into the total curriculum.

The material that follows is not meant to be exhaustive, but rather some of the better material related to environmental education.

Some of the major categories that follow are:

A. Sources of prepared environmental education curriculum materials for teachers.

B. Information agencies and organizations.

C. Sources of environmental, natural history and ecological films.

D. Periodicals

E. Publishing companies.

F. Bibiography of environmental and instructional materials.

G. Environmental monitoring kits.

H. Environmental games and simulations.

A. SOURCES OF PREPARED ENVIRONMENTAL EDUCATION

CURRICULUM MATERIALS FOR TEACHERS

AIR POLLUTION CONTROL ASSOCIATION - 4400 Fifth Ave., Pittsburgh, Pa., 15213: "Air Pollution Experiments for Junior and Senior High School Science Classes." (1969) $1.00/copy.

AMERICAN EDUCATION PUBLICATIONS - Education Center, Columbus, Ohio 43216: "Focus on Pollution" ecology series with teacher guidelines. Designed for upper elementary-junior high. Includes experiments.

AMERICAN FOREST INSTITUTE - 1619 Massachusetts Ave., N.W., Washington, D.C. 20036: "Learn to Love Trees", a sample of teaching units prepared for the Institute for Elementary Teachers. Single copies free. Quantity copies .05¢ each.

AMERICAN LUNG ASSOCIATION - Contact your local branch as listed in your telephone directory for information and curriculum suggestions on air pollution and health. Guide available free of charge. K-12.

THE CENTER FOR CURRICULUM DESIGN - P.O. Box 350, Evanston, Ill., 60204: "You are an Environment" teaching-learning activities designed to develop environmental attitudes. Send for catalog which includes price information for curriculum, films and books.

CONCERN, INC. - 2100 M. St., N.W., Washington, D.C. 20037: Copies of "Eco-Tips" available on a number of environmental/ecological topics. Examples include "Solid Waste," "Over-Packaging," "Automobile Pollution" and "Consumer Guidelines." Published in pamphlet form, $5.00/100.

CONSERVATION AND ENVIRONMENTAL STUDIES CENTER - Box 2230 R.D. 2, Brown Mills, New Jersey, 08015: A multidisciplinary approach in curriculum design. Includes background information, activities and resources. Sample units include: "Land Use", "Water, the Waste of Plenty," "Angling for an Unknown Direction." Good for use in mathematics classes, Junior High and up. $1.50 each.

EAST SYRACUSE - MINOA - Environmental Education Project Coordinator, Administration Building, 407 Fremont Rd., East Syracuse, N.Y., 13057: Science and Social Studies curriculum guide, K-12. Divided into elementary, middle school and high school. Complete listings of concepts, corresponding activities and resources. Individual grades. $.50-$1.00. Total curriculum package, $8.00.

ECOLOGY CENTER OF ANN ARBOR - Environmental Education Coordinator, 417 Detroit St., Ann Arbor, Michigan 48104: Designed curriculum available on Organic Gardening, Energy, Transportation, Solid Waste and Basic Ecological Concepts. Resource materials available for free-loan. $.10/unit.

ENVIRONMENTAL ACTION COALITION - ECO-NEWS - 325 E. 49th St., N.Y., N.Y., 10017: Children's newsletter accompanied by corresponding teacher's guide. Individual issues devoted to single topic areas such as: recycling, trees, population and solid waste. Very reasonably priced.

ENVIRONMENTAL SCIENCE CENTER - 5400 Glenwood Ave., Golden Valley, Minnesota 55422: Curriculum materials designed for middle school-adult. Science oriented with experiments. Sample units include: "Transect Studies," "Life Forms and Soil," "Soil Testing and Sampling," "Nature Unit," "Outdoor Activities," "Population," and "Micro-Climates." Prices vary from .50-$1.00/unit.

ERIC - Center for Science, Mathematics and Environmental Education, 1800 Cannon Dr., 400 Lincoln Tower, Ohio State University, Columbus, Ohio 43210: A resource service organized by topic areas and grade levels. Sample environmenal education materials include: "A Review of Environmental Education for Teachers of Urban/Disadvantaged" and "100 Activities for Environmental Education." Both $3.50.

THE GARDEN CLUB OF AMERICA - Conservation Committee, 518 Madison Ave., N.Y., N.Y. 10022: Conservation oriented curriculum suggestions and audio-visual aids on Birds, Wildlife and Conservation. K-6. Free.

GIRL SCOUTS - ECO-ACTION PROJECT BOOKS - Girl Scouts of Metropolitan Detroit, 153 E. Elizabeth St., Detroit, Michigan 48002: Especially designed curriculum materials for Girl Scouts but suitable applications for elementary classes. Three successive guidebooks and corresponding Leader's Guides introduce ecology and progress to problem-solving and action projects. Write for price information.

J.G. FERGUSON PUBLISHING CO. - 6 N. Michigan Ave., Chicago, Ill. 60602: "People and their Environment" conservation education curriculum guides for teachers, grades 1-12. Include sources of materials and bibliography of books and films. Volumes $3.95 each or 3 or more volumes, $3.50 each.

KEEP AMERICA BEAUTIFUL - 99 Park Ave., N.Y., N.Y. 10016: Litter prevention and other pollution control projects for high school students. Sample titles include: "Litter Laws" and "71 Things You Can Do to Stop Pollution." Free.

NATIONAL AUDUBON SOCIETY - 1150 5th Ave., N.Y., N.Y. 10022. Curriculum guidelines related to birds, wildlife and nature study. High quality. Consult local branches for price information or write for catalog of education materials.

NATIONAL EDUCATION ASSOCIATION - Sales Section, 1201 Sixteenth St., N.W., Washington, D.C. 20036: "Man and His Environment - An Introduction to Using Environmental Study Areas." Designed to acquaint teachers with new ideas and practices that focus on the interdisciplinary approach to environmental education. Book and filmstrip combination. $1.75. (Publications catalog available)

NATIONAL WILDLIFE FEDERATION - Educational Service Division, 1412 16th St., N.W., Washington, D.C. 20036: Many educational publications, including written curriculum guidelines and Action Leaflets on endangered species, Wildlife of farm and field, Wildlife of forests and rangelands, Wildlife of lakes, marshes and streams. 10¢/copy. NWF is also the publisher for Minnesota Environmental Science Federation, Inc. - Environmental Discovery Units available on "Plants in the Classroom," "Oaks, Acorns, Climate and Habitat," "Man's Habitat: The City," and "Vacant Lot Studies," as examples. Elementary level. $1.00 - 1.50.

NORTH JERSEY CONSERVATION FOUNDATION - 300 Mendham Rd., Morristown New Jersey 07960: "Education for Survival: Ecology in Science and Social Studies." An interdisciplinary approach designed with concept pages, facts and classroom activities. Also included are charts and diagrams. Teacher's guides accompany the 4 volume set, arranged sequentially grades 1-6. Volumes vary in price from $4.00 - 6.00.

P.A. SCHILLER AND ASSOCIATES - P.O. Box 306, Chicago, Ill. 60690 "Knock the Four Walls Down." Inexpensive teaching units in environmental education. Investigations include "In Search of the Sun and the Water," "Creative Writing," "Food Chains," "Streams - all Water?," and "Touch in the Environment." Elementary and junior high. Vary in price from $.35 - .50.

PENNSYLVANIA DEPARTMENT OF EDUCATION - Science Education Advisor, Bureau of General and Academic Education, Box 911, Harrisburg, Pa., 17126: "Reprints of Environmental Instructional Activities." K-6 and 7-12. Spaceship earth concepts. Also, "Science, Nature and the Survival of Man," a non-science environment course for secondary students. Both include background information, activities, and bibliographical information.

PENNSYLVANIA TUBERCULOSIS AND RESPIRATORY DISEASE ASSOCIATION - 311 S. Juniper St., Philadelphia, Pa., 19107: "Our Polluted Air - A Teacher's Guide for a Mobile Workshop." Six lesson plans, complete with flannel board kit. Designed to help elementary school students comprehend the nature of the air pollution problem and the possibilities for a solution. $45.00 East of the Mississippi; $50.00 West of the Mississippi.

PROJECT SEE - Wyandotte Public Schools, 891 Goddard Rd., Wyandotte, Michigan 48192: GREEPS, on insects, making compost, energy and air pollution. Lower elementary through adult.

RONDALE PRESS - Educational Services Division, Emmaus, Pa. 18049: "Environmental Education the Organic Way" a series of activities and educational materials tying environmental education to an organic trend in living. Single units on the following: "Best Ways to Improve Your Soil," "Handbook of Composting," "Teaching Science with Garbage," "The Organic Classroom," "Basic Organic Gardening Course," "Teaching Science with Soil," and the "Organic Living Series." K-9. Single units $1.50.

SCIENCE CURRICULUM IMPROVEMENT STUDY - Published by Rand McNally, 405 Park Ave., N.Y., N.Y. 10022: Teacher guidelines and curriculum activities arranged in a series on the following topics: Populations, Environmental Cycles, Ecosystems, Community and Life cycles, Excellent experiments and classroom activities. $1.50 each.

SOIL CONSERVATION DISTRICT - 6101 Jackson Rd., Ann Arbor, Michigan 48103: Curriculum materials on Food, Land, Water, Soil and Outdoor Classrooms on School Sites. Elementary. Free. (Also information on attracting wildlife.)

U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE - Washington, D.C. 20250: Curriculum units on "Forest Succession," "Forest Diseases," and "Forest Products," as examples. Conservation teaching aids mainly designed for elementary. Girl Scouts Newsletter available, with corresponding teacher guides. Free.

SOIL CONSERVATION SOCIETY OF AMERICA - 7515 N.E. Ankeny Rd., Ankeny, Iowa 50021: "Environmental Quality and the Citizen - A Teaching Guide for Adult Education Courses Related to the Environment." Single copies, $2.00, postpaid; 2-10, $1.50 ea.; 11-99, $1.25 ea.; 100 or more, $1.00 ea.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY - Most publications available through United States Government Printing Office, Washington, D.C. 20402: "The Processing and Recovery of Jon Thomas Cool Cat" and "There Lived a Wicked Dragon" coloring and activities books for children on Solid Waste. $.55 ea. Legislative summaries and pollution control laws also available.

UNITED STATES FOREST SERVICE - E. Region, Milwaukee, Wisconsin, 53203: "Investigating Your Environment Series." A sensitivity awareness and problem-solving approach for upper elementary students through adults. Units on soils, forests, water, wildlife and outdoor activities. Experiments included. Free.

WEBSTER-McGRAW-HILL BOOK COMPANY - Manchester Rd., Manchester, Mo., 63011: "Elementary Science Study." Complementary teacher's guides, problem cards and student kits on these sample topics: "Growing Seeds," "Micro-gardening," "Pond Water," and "Rocks." Available in classroom quantities. Reasonably priced.

XERO POPULATION GROWTH - Population Reference Bureau, Inc. 1755 Massachusetts Ave., N.W., Washington, D.C. 20036. "The World Population Dilemma," a textbook on population designed for elementary and secondary students. Part of a series entitled "This Crowded World" (grades 4-6) and "People" (grades 7-9). World and U.S. population data in chart form also available. Free.

B. NON-GOVERNMENTAL ORGANIZATIONS ACTIVE IN ENVIRONMENTAL EDUCATION

The Alliance For Environmental Education
1619 Massachusetts Avenue, NW
Washington, D.C. 20036
(202) 797-4530

American Federation Of Teachers
11 Dupont Circle
Washington, D.C. 20005
(202) 797-4400

American Forest Institute
1619 Massachusetts Avenue, NW
Washington, D.C. 20036
(202) 797-4530

American Institute Of Architects
1735 New York Avenue, NW
Washington, D.C. 20006
(202) 785-7300

American Nature Study Society
c/o Dr. John Gustafson
R.D. 1
Homer, NY 13077
(607) 749-3655

American Society For Environmental Education
33 Mill Road
P.O. Box R
Durham, NH 03824
(603) 868-5700

Association For Environmental And Outdoor Education
Don Bielefield
253 Johnstone Court
San Rafael, CA 94903
(415) 556-4366

Boy Scouts Of America
National Office
North Brunswick, NJ 08902
(201) 249-6000

Citizens For Clean Air
40 W. 57th St.
New York, NY 10019

Conservation Education Association
Richard W. Presnell
Secretary-Treasurer, Conservation Education Association
University of Wisconsin-Green Bay
Green Bay, WI 54302
(414) 465-2391

Foresta Institute For Ocean And Mountain Studies
8205 Franktown Road
Carson City, NV 89701
(702) 882-6361

Girl Scouts Of The U.S.A.
830 Third Avenue
New York, NY 10022
(212) 940-7500

International Union For Conservation
Of Nature And Natural Resources
2000 P St., NW
Washington, D.C. 20006

Izaak Walton League Of America
Suite 806
1800 N. Kent Street
Arlington, VA 22209
(703) 528-1818

League Of Women Voters Of The United States
Education Fund
1730 M Street, NW
Washington, D.C. 20036
(202) 296-1770

Massachusetts Audubon Society
Lincoln, MA 01773
(617) 259-9500

National Association For Environmental Education
P.O. Box 400
Troy, OH 45373

National Audubon Society
950 Third Avenue
New York, NY 10022
(212) 832-3200
Russell W. Peterson, President

National Council For Geographic Education
University of Houston
Houston, TX 77004
(713) 749-4439
Charles F. Gritzner, Executive Director

National Education Association
1201 Sixteenth Street, NW
Washington, D.C. 20036
(202) 833-4000
John Ryor, President
Terry Herndon, Executive Director

National Parks And Conservation Association
1701 Eighteenth Street, NW
Washington, D.C. 20009
(202) 265-2717

National Science Teachers Association
1742 Connecticut Avenue, NW
Washington, D.C. 20009
(202) 265-4150
Robert L. Silber, Executive Director

National Wildlife Federation
1412 Sixteenth Street, NW
Washington, D.C. 20036
(202) 797-6800
Thomas E. Kimball, Executive Vice President

The Nature Conservancy
1800 North Kent Street
Arlington, VA 22209
(703) 841-5300

Planned Parenthood World Population
515 Madison Avenue
New York, NY 10022

Population Council, Inc.
230 Park Avenue
New York, NY 10017

Sierra Club
1050 Mills Tower
San Francisco, CA 94104

Soil Conservation Society Of America
7515 Northeast Ankeny Road
Ankeny, IA 50021
(515) 289-2331

United Auto Workers
Conservation Department
8000 East Jefferson Avenue
Detroit, MI 48214
(313) 926-5271

Wildlife Management Institute
709 Wire Building
1000 Vermont Avenue, NW
Washington, D.C. 20005
(202) 347-1774

Zero Population Growth
1346 Connecticut Avenue, NW
Washington, D.C. 20036
(202) 785-0100

C. SOURCES OF ENVIRONMENTAL, NATURAL HISTORY AND ECOLOGICAL FILMS

ABC MEDIA CONCEPTS - 1330 Avenue of the Americas, New York, N.Y. 10019

AIMS INSTRUCTIONAL MEDIA SERVICES, INC. - P.O. Box 1010, Hollywood, California 90028

AMERICAN DOCUMENTARY FILMS - 379 Bay St., San Francisco, CA 94133

AMERICAN EDUCATIONAL FILMS - 331 N. Maple Dr., Beverly Hills, CA 90210

BARR FILMS - Post Office Box 7-C, Pasadena, CA 91104

CENTRON FILM - 1621 West Ninth St., Lawrence, KS 66044

CHURCHILL FILMS - 662 N. Robertson Blvd., Los Angeles, CA 90069

CINEMA ASSOCIATE PRODUCTIONS, INC. - Box 621, E. Lansing, MI 48323

THE CONSERVATION FOUNDATION - 1717 Massachusetts Ave., N.W., Washington, D.C. 20036

CONTEMPORARY McGRAW-HILL FILMS - 828 Custer Ave., Evanston, IL 60202

CREATIVE FILM SOCIETY - 7237 Canby Avenue, Reseda, CA 90069

ENCYCLOPEDIA BRITANNICA EDUCATIONAL CORPORATION - 425 N. Michigan Ave., Chicago, IL 60611

ENVIRONMENTAL EDUCATORS, INC., - 732 7th St., N.W., Washington, D.C. 20006

ENVIRONMENTAL INFORMATION CENTER - 124 39th St., N.Y., N.Y. 10016

E-P SERVICES, c/o ACES, 800 Dixwell Avenue, New Haven, CT 06511

FILMS FOR SOCIAL CHANGE - 6244 Delmar Blvd., St. Louis, MO 63130

FILMS INCORPORATED - 1144 Wilmette Ave., Wilmette, IL 60091

STUART FINLEY, INC. - 3428 Mansfield Rd., Fall Church, VA 22041

HOLT, RINEHART AND WINSTON, INC. - Media Department, 383 Madison Ave., New York, NY 10017

HOUGHTON MIFFLIN, 110 Tremont Street, Boston, Massachusetts 02107

LEARNING CORPORATION OF AMERICA - 711 Fifth Ave., N.Y., N.Y. 10022

MASS MEDIA ASSOCIATES - 2116 N. Charles St., Baltimore, MD 21218

MEDIA FOR THE URBAN ENVIRONMENT - 75 Frost St., Brooklyn, N.Y. 11211

NBC EDUCATIONAL ENTERPRISES - 30 Rockefeller Plaza, N.Y., N.Y. 10020

NATIONAL ASSOCIATION OF CONSERVATION DISTRICTS - Environmental Film Service, P.O. Box 855, League City, Texas 77573

NATIONAL ASSOCIATION FOR FOREIGN STUDENT AFFAIRS, 1860-19th Street, N.W. Washington, D.C. 20009

NATIONAL AUDUBON SOCIETY - Photo and Film Department, 930 Third Ave., New York, New York 10022

NATIONAL BANK OF DETROIT - Public Relations Department, 611 Woodward Avenue, Detroit, Michigan 48232

NATIONAL FILM BOARD OF CANADA - 680 5th Avenue, N.Y., N.Y. 10013

NATIONAL TUBERCULOSIS AND RESPIRATORY DISEASE ASSOCIATION - 1740 Broadway, New York, NY. 10019

PICTURA - 111 Eighth Ave., New York, N.Y. 10011

PLANNED PARENTHOOD - WORLD POPULATION - Film Library, 267 W. 25th St., New York, New York 10001

POPULATION REFERENCE BUREAU, INC. 1337 Connecticut Avenue, N.W. Washington, D.C. 20036

PYRAMID FILMS - Box 1048, Santa Monica, CA 90406

RODALE PRESS FILMS - c/o Bullfrog Films, Box 114, Milford Square, PA 18935

SIERRA CLUB FILM LIBRARY - c/o Association-Sterling Films, La Grange, Illinois 60525

TIME - LIFE FILMS - 43 W. 16th Street, N.Y., NY. 10010

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY - Region V, One North Wacker Drive, Chicago, Illinois 60606

UNIVERSITY OF CALIFORNIA, EXTENSION MEDIA CENTER - Berkeley, CA 94720

JOHN WILEY AND SONS, INC. - 605 3rd Avenue, N.Y., N.Y. 10016

XEROX FILMS - Stamford, CT 06904

ZERO POPULATION GROWTH, 1346 Connecticut Avenue, N.W., Washington, D.C. 20036

D. PERIODICALS

The following periodicals are highly relevant to environmental education. Some of these should be in your school library. Others you may want to subscribe to personally.

American Biology Teacher
National Association of Biology Teachers
1420 North Street,
Washington, D.C.

American Forests Magazine
American Forestry Association
919 17th Street, N.W.
Washington, D.C. 20006

Audubon
National Audubon Society
1130 Fifth Avenue
New York, New York 10023

Bioscience
American Institute of Biological Sciences, Inc.
3900 Wisconsin Avenue, N.W.
Washington, D.C. 20016

Catalyst - For Environmental Quality
274 Madison Avenue,
New York, NY 10016

Childhood Education
Association for Childhood Education International
3615 Wisconsin Avenue, N.W.
Washington, D.C. 20016
Issue of October, 1970

Current History (A World Affairs Monthly)
1822 Ludlow Street
Philadelphia, PA 19103
U.S. Resources: A Tally Sheet/June,'70
America's Polluted Environment/July,'70
Options for a Cleaner America/August,'70

Current Science
American Education Pubs. Science Div.
55 High Street
Middletown, Conn. 06457

Ecology
The Journal of Cultural Transformation
Ecology Action Educational Institute
Box 3895
Modesto, CA 95352

Eco-News
Childrens Environmental Newsletter (monthly, Grades: 2-8)
Environmental Action Coalition
235 East 49th St.
New York, N.Y. 10017

Editorial Research Report on Urban Env.
Editorial Research Reports
1735 K St.
Washington, D.C. 20006

Environment
438 North Skinker Blvd.
St. Louis, Missouri 63130

Environment and Behavior
Sage Publications, Inc.,
275 South Beverly Drive
Beverly Hills, CA 90212

Environmental Science & Technology
American Chemical Society
1155 16th St., N.W.
Washington, D.C. 20036

Environmental Quality Magazine
Environmental Awareness Assoc., Inc.
6355 Topanga Canyon Blvd.
Woodland Hills, CA 91364

Grade Teacher
Mr. Harold Littledale, Editor
22 W. Putnam Avenue
Greenwich, Conn. 06830
Articles of Jan. '68 and '69

Journal of Environmental Education
Heldref Publications
4000 Albemarle St., N.W.
Suite 504
Washington, D.C. 20016

Journal of Outdoor Education
Northern Illinois University
Box 299
Oregon, IL 61061

Land Pollution Reporter
Freed Publishing Co.
P.O Box 1144
FDR Station
New York, N.Y. 10022

The Living Wilderness Quarterly
The Wilderness Society
729 15th St., N.W.
Washington, D.C. 20005

Man's Control of the Environment
Congressional Quarterly
1735 K Street
Washington, D.C. 20006

National Parks Magazine
National Parks Association
1701 13th St., N.W.
Washington, D.C. 20009

National Wildlife Magazine
National Wildlife Federation
1412 Sixteenth St., N.W.
Washington, D.C. 20036

Naturalist
Natural History Society
Medical Arts Building
Minneapolis, MN 55402

Natural Study Magazine
A Journal for the Advancement
of Environmental Education
The American Nature Study Soc.
R.D. #1
Homer, New York 13077

Pacific Search
Journal of Natural Science in
the Pacific Northwest
200 Second Avenue, N.
Seattle, Washington 98109

Public Affairs Pamphlet
#403 Air; #421 Environment fit
for People; #450 Noise
Public Affairs Committee
381 Park Ave. S.
New York, NY 10016

Ranger Rick's Nature Magazine
National Wildlife Federation
1412 - 16th Street, N.W.
Washington, D.C. 20036

Scholastic Teacher
Scholastic Magazines, Inc.
50 W. 44 St.
New York, NY 10036

Science
American Association for
Advancement of Science
1515 Massachusetts Ave., N.W.
Washington, D.C. 20005

Science Activities Magazine
8150 Central Park Avenue
Skokie, IL 60076

Scientific American
415 Madison Avenue
New York, NY 10017

Science and Children
National Science Teachers Assoc.
1201 16th St., N.W.
Washington, D.C. 20036

The Science Teacher
National Science Teachers Assoc.
1201 16th St., N.W.
Washington, D.C. 20036

Sierra Club Bulletin
Sierra Club
1050 Mills Tower
San Francisco, CA 94104

Today's Education
The Journal of the National Education
Association
1201 16th., N.W.
Washington, D.C. 20036

E. PUBLISHING COMPANIES

The following publishing houses produce excellent environmental materials. A letter to any of the publishing companies requesting a catalogue should provide information pertaining to the variety of instructional aids produced.

Allyn & Bacon, Inc.
470 Atlantic Avenue
Boston, Massachusetts 02210

Atheneum Publishers
122 E. 42nd Street
New York, N.Y. 10017

T.J. Chandler Publishing Co.
124 Spear Street
San Francisco, CA 94105

Crowell Collier-MacMillan
866 Third Avenue
New York, N.Y. 10022

Crown Publishers, Inc.
419 Park Avenue., South
New York, N.Y. 10016

Columbia Books, Inc.
917 15th St., N.W.
Washington, D.C. 20005

Coward-McCann, Inc.
200 Madison Avenue
New York, N.Y. 10016

The John Day Co., Inc.
62 W. 45 Street
New York, New York 10036

Doubleday & Co., Inc.
277 Park Avenue
New York, N.Y. 10017

E.P. Dutton & Co., Inc.
201 Park Avenue, South
New York, N.Y. 10003

Franklin Watts, Inc.
575 Lexington Avenue
New York, N.Y.

Golden Gate Junior Books
543 Old Country Road
San Carolos, CA 94070

Crosset & Dunlap, Inc.
51 Madison Avenue
New York, N.Y. 10010

E.M. Hale & Co.
1201 S. Hastings Way
Eau Claire, Wisconsin 54701

Harcourt Brace Jovanovich
757 Third Avenue
New York, N.Y. 10017

Holiday House
18 E. 57th St.
New York, N.Y. 10022

Holt, Rinehart & Winston, Inc.
383 Madison Avenue
New York, N.Y. 10017

Houghton Mifflin Co.
110 Tremont Street
Boston, MA 02107

J.B. Lippincott Co.
E. Washington Square
Philadelphia, PA 19105

Lothrop, Lee & Shepard
381 Park Avenue, South
New York, N.Y. 10016

McGraw-Hill Book Co.
330 W. 42nd St.
New York, N.Y.

Natural History Press
Central Park West at 79th St.
New York, N.Y. 10024

Parents' Magazine Press
52 Vanderbilt Avenue
New York, N.Y. 10017

Prentice-Hall, Inc.
Englewood Cliffs, N.J. 17632

G.P. Putnam's Sons
200 Madison Avenue
New York, N.Y. 10016

Rand McNally & Co.
405 Park Avenue
New York, N.Y. 10022

Educational Division
Reader's Digest Services, Inc.
Pleasantville, N.Y. 10570

Charles Scribner's Sons
597 Fifth Avenue
New York, N.Y. 10017

Simon & Schuster
1 West 39th St.
New York, N.Y. 10018

Time-Life Books
Time & Life Bldg.
Rockefeller Center
New York, New York 10020

The Viking Press, Inc.
625 Madison Avenue
New York, N.Y. 10022

Frederick Warner & Co., Inc.
101 Fifth Avenue
New York, N.Y.

Washington Square Press
630 Fifth Avenue
New York, N.Y. 10010

The World Publishing Co.
110 E. 59th Street
New York, N.Y. 10022

F. BIBLIOGRAPHY OF ENVIRONMENTAL AND INSTRUCTIONAL MATERIALS

Philosophical Basis

Boulding, Kenneth, Henry Clark. The Human Values on Spaceship Earth. New York: Council Press, 1966.

Brameld, T. The teacher as world citizen: A scenario of the 21st century. Palm Springs, Calif.: ETC Publications, 1976.

Claus, George and Karen Bolander. Ecological Sanity. New York: David McKay Company, Inc., 1977. 592 p. $16.95.

Commoner, Barry. Science and Survival. Viking, 1963.

Commoner, Barry. The Closing Circle: Nature, Man and Technology. New York: Alfred A. Knopf, 1971.

Conrad, D.R. Education for transformation: Implications in Lewis Mumford's ecohumanism. Palm Springs, Calif.: ETC Publications, 1976.

Dubos, Rene. So Human an Animal. Doubleday, 1969.

Hardin, Garett. "The Tragedy of the Commons." Science, December 13, 1968, pp. 1243-8.

Leopold, Aldo. The Sand County Almanac. University Press, 1949.

Michael, Donald. The Unprepared Society. Vintage, 1969.

Nash, Roderick. Environment and Americans. New York: Holt, Rinehart and Winston, 1972.

O'Toole, James. Energy and Social Change. Cambridge, Massachusetts: The M.I.T. Press, 1976. 185 p. $9.95.

White, Lynn, Jr. "The Historical Roots of our Ecological Crisis." Science, (March 10, 1967), 1203-07.

Environmental Overview

Boughey, Arthur S. Man and the Environment. New York: Macmillan Co, 1971.

Burton, I., Kates, R.W. & White, G.F. The environment as hazard. Oxford University Press, 1978.

Carson, Rachel. Silent Spring. Houghton-Mifflin, 1962.

Caudill, Harry. Night Comes to the Cumberlands. Little, Brown & Co., 1962.

Cohen, S.B. & B. Kaplan (Eds.), Experiencing the environment. New York: Plenum Press, 1976.

DeBell, Garrett. The Environmental Handbook. Ballantine, 1970.

Detwyler, Thomas R. Man's Impact on Environment. New York: McGraw-Hill Book Company, 1971.

Eckholm, Erik P. Losing Ground. W.W. Norton, New York, 1976.

Fabun, Don. Dimensions of Change. Beverly Hills, Calif. Blencoe Press, 1971.

Farb, Peter. Face of North America: The Natural History of a Continent. New York: Harper & Row, 1963.

Foster, John T. The Sea Miners. New York: Hastings House.

Havlick, Spenser, W. The Urban Organism. The Macmillan Company, New York, 1974.

Helfrich, Harold W., Jr. (ed.). The Environmental Crisis: Man's Struggle to Live with Himself. New Haven: Yale University Press, 1970.

Hodges, Laurent. Environmental Pollution. New York: Holt, Rinehart & Winston, 1977. 496 p.

Large, David B. Hidden Waste. Washington, D.C.: The Conservation Foundation, 1976. 109 p.

Massachusetts Institute of Technology. Man's Impact on the Global Environment: Assessment and Recommendations for Action. Cambridge, Massachusetts: The MIT Press, 1970.

Miller, G. Tyler, Jr. Living in the Environment, Concepts, Problems, and Alternatives. Wadsworth Publishing Company, Inc., California, 1975.

Murdoch, William W. Environment: Resources, Pollution and Society. Stamford, Connecticut: Sinauer Associates, Inc., 1971.

Muller, Jorg. The Changing City. New York: Atheneum Publishers, 1976.

Nash, Roderick. The American Environment, Readings in the History of Conservation. Addison-Wesley, 1968.

Newman, Oscar. Defensible Space. Collier Books, New York, 1975.

Patty, F.A., (ed). Industrial Hygiene and Toxicology, 3rd. Ed. New York: Wiley, 1978.

Raskin, E. Architecture and people. Englewood Cliffs, N.J.: Prentice-Hall, 1974.

Rechel, Ralph. Transportation Policies and Energy Conservation. Washington, D.C.: The Conservation Foundation, 1976. 71 p. $3.50.

Russell, Helen Ross. Earth, the Great Recycler. Nashville: Thomas Nelson, Inc., 1973. 160 p. $6.95.

Saarinen, T.F. Environmental planning: Perception and behavior. Boston: Houghton Mifflin, 1976.

Sayre, Kenneth, ed. Values in the Electric Power Industry. Notre Dame, Indiana: University of Notre Dame Press, 1977. 293 p. $10.95.

Sharpe, Grant., Hendee, Clare W., and Allen, Shirley W. An Introduction to American Forestry. McGraw-Hill Book Company, Inc., New York. fourth edition, 1976. 544 p.

Smaridge, Norah. Only Silly People Waste. Nashville: Abingdon Press, 1976. 20 p. $4.25.

Stumm, W. (ed.). Global Chemical Cycles and Their Alterations by Man. Philadelphia: Heyden and Son, Inc., 1977.

Tallman, I. Passion, action, and politics: A perspective on social problems and social-problem solving. San Francisco: Freeman, 1976.

Toffler, Alvin. Future Shock. New York: Bantam Books, 1970.

Trefethen, James B.. The American Landscape: 1776-1976, Two Centuries of Change. Washington, D.C.: Wildlife Management Institute, 1976. 91 p. $2.50.

Wilson, Richard, and William J. Jones. Energy, Ecology, and the Environment. New York: Academic Press, Inc., 1974. 353 p.

General Ecology and Natural History

Bardach, John. Harvest of the Sea. Harper and Row, 1970.

Bellrose, Frank C., Ducks, Geese and Swans of North America. Penn: Stackpole Books, 1976.

Damon, Albert. Human Biology and Ecology. New York: W.W. Norton & Company Inc., 1977. 367 p.

Ehrenfeld, David W. Biological Conservation. New York: Holt, Rinehart and Winston, Inc., 1970.

Hinckley, Alden D. Applied Ecology: A Nontechnical Approach. New York: Macmillan, Inc., 1976. 342 p.

Hoke, John. Ecology. New York: Franklin Watts, Inc., 1977. 63 p.

Hutchinson, G.E. Treatise on Limnology. New York: Wiley-Interscience, 1975.

Kormonday, Edward John. Concepts of Ecology. Englewood Cliffs, New Jersey: Prentice-Hall, 1969.

Oesting, Henry J. The Study of Plant Communities. W.H. Freeman and Co., 1958.

Odum, Eugene P. Fundamentals of Ecology. W.B. Saunders Co., 1978.

Passmore, J. Man's responsibility for nature: Ecological problems and Western traditions. New York: Scribner's, 1974.

Ross, D. Introduction to Oceanography. Englewood Cliffs, N.J.: Prentice-Hall, 1977.

Southwick, C.H. Ecology and the Quality of our Environment, 2nd Ed. New York: Van Nostrand, 1976.

Storer, John. Man in the Web of Life. The New American Library, 1974.

Tanner, Thomas R. Ecology, Environment, and Education. Lincoln, Nebraska: Professional Educators Publications, Inc., 1974. 106 p.

White, William Jr. The Edge of the Pond. New York: Sterling Publishing Co., Inc., 1976. 80 p. $4.95.

Urban Environment, Problems and Planning

Casarett, L.J. and Doull, J. (ed.). Toxicology: The Basic Science of Poisons. New York: Macmillan, 1975.

De Bruin, A. Biochemical Toxicology of Environmental Agents. New York: Elsevier/North-Holland, 1976.

Ehrlich, Paul R. Population, Resources, Environment: Issues in Human Ecology. San Francisco: W.H. Freeman, 1970.

Ehrlich, Paul. The Population Bomb. Ballantine Books, 1968.

Etzkovitz, Henry. Ghetto Crisis. Little, Brown and Co., 1969.

Freire, Paulo. Pedagogy of the Oppressed. New York: Herder and Herder, 1968.

Gans, Herbert J. People and Plans: Essays on Urban Problems and Solution. Basic Books, 1968.

Institute for Environmental Education. A Curriculum Activities Guide to Water Pollution and Environmental Studies. Vol. One. Cleveland Heights, Ohio; Institute for Environmental Education, 1971.

Institute for Environmental Education. A Curriculum Activities Guide to Water Pollution and Environmental Studies. Vol. Two. Cleveland Heights, Ohio; Institute for Environmental Education, 1971.

Jacobs, Jane. *The Economy of Cities*. Random House, 1969.

King, Richard L. *Airport Noise Pollution: A Bibliography of Its Effects on People and Property*. Metuchen, New Jersey: Scarecrow Press, Inc., 1973. 380 p.

McHarg, Ian. *Design With Nature*. Natural History Press, 1969.

Malthus, Thomas, Julian Huxley and Frederick Osborn. *On Population: Three Essays*. New York: New American Library, 1960.

Mansfield, T.A. (ed.). *Effects of Air Pollutants on Plants*. Cambridge: Cambridge University, 1976.

Michelson, William. *Man and His Urban Environment: A Sociological Approach*. Reading, Massachusetts: Addison-Wesley Publishing Company, 1970.

Mowbray, Allen Q. *Road to Ruin*. Philadelphia: Lippincott, 1969.

Navarra, John G. *Our Noisy World*. Doubleday, 1969.

President's Council on Recreation and Natural Beauty, *From Sea to Shining Sea*. U.S. Printing Office, 1968.

Smerk, George M. *Readings in Urban Transportation*. Indiana University Press, 1968.

Stern, A.C. (ed.). *Air Pollution*, 3rd Ed. (5 vols.). New York: Academic Press, 1977.

Waldbott, G.L. *Health Effects of Environmental Pollutants*, 2nd Ed. St. Louis: C.V. Mosby Co., 1978.

Whyte, William. *The Last Landscape*. Doubleday, 1967.

Environmental Policy

Caldwell, Lynton K. *Environment: A Challenge for Modern Society*. Garden City, New York: The Natural History Press, 1970.

Caldwell, L.K. *Man and his environment: Policy and administration*. New York: Harper & Row, 1975.

Davis, J. Clarence, Ill., *The Politics of Pollution*. Pegasus Book, 1970.

Landy, Marc Karnis, *The Politics of Environmental Reform: Controlling Kentucky Strip Mining*. Baltimore: The Johns Hopkins University Press, 1976. 400 p. $8.95.

Linville, J.,Jr. & Davis, R. *The political environment: An ecosystem approach to urban management*. Washington, D.C.: American Institute of Planners, 1976.

Moynihan, Daniel. Towards a National Urban Policy. New York: Basic, 1970.

Ridgeway, James. The Politics of Ecology. New York: E.P. Dutton & Co., 1971.

Robinson, Glen O. The Forest Service, A Study in Public Land Management. Johns Hopkins University Press, Baltimore. 1975. 337 pp.

Stafford, Walter S. Politics in an Urban Society. Detroit: University of Detroit Press, 1970.

Economics and Environmental Conservation

Commoner, B. The poverty of power: Energy and economic crisis. New York: Knopf, 1976.

Crocker, Thomas D. and Rogers, A.J., III. Environmental Economics. Hinsdale, Illinois: The Dryden Press, Inc., 1971.

Dorfman, Robert; Dorfman, Nancy. Economics and the Environment. New York: W.W. Norton & Co., 1972.

Galbraith, J.K. The New Industrial State. Houghton-Mifflin, 1967.

Goldman, Marshall. Controlling Pollution: The Economics of a Cleaner America. Prentice-Hall, 1967.

Herfindahl, Orris C. and Allen V. Kneese. Quality of the Environment: An Economic Approach to Some Problems of Using Land, Water, and Air. Resources for the Future, 1965.

Johnson, Warren A. and John Hardesty. Economic Growth vs. The Environment. Belmont, California: Wadsworth Publishing Company, 1971.

Muller, Thomas. Economic Impacts of Land Development: Employment, Housing, and Property Values. Washington, D.C.: Urban Institute, 1976. 148 p. $3.95.

Samuelson, Paul A. Economics, and Introductory Analysis. McGraw-Hill Book Company, 1977.

Environmental Psychology and Communications

Bem, Daryl, J. Beliefs, Attitudes, and Human Affairs. Belmont, California: Brooks/Cole Publishing Company, 1970.

Bosmajian, Haig A. The Rhetoric of Nonverbal Communications: Readings, Glenview, Illinois: Scott, Foresman and Company, 1971.

Fishbein, M., & Ajzen, I. Belief, attitude, intention and behavior: An introduction to theory and research. Reading, Mass.: Addison-Wesley, 1975.

Freedman, J.L. Crowding and behavior. San Francisco: Freeman, 1975.

Ittelson, W.H., Proshansky, H.M., Rivlin, L.G., & Winkel, G.H. An introduction to environmental psychology. New York: Holt, Rinehart and Winston, 1974.

Johnson, Nicholas. How to Talk Back to Your Television Set. New York: Bantam Books, 1970.

Kates, R.W. Experiencing the environment as hazard. In S. Wapner, S.B. Cohen, & B. Kaplan (Eds.), Experiencing the environment. New York: Plenum Press, 1976.

Korman, A.K. The psychology of motivation. Englewood Cliffs, N.J.: Prentice-Hall, 1974.

Lindsay, P.H. & Norman, D.A. Human information processing: An Introduction to Psychology (2nd ed.). New York: Academic Press, 1977.

Lowenthall, David. Environmental Perception and Behavior. University of Chicago Geography Research Paper No. 109. Chicago, Illinois, 1967.

Maslow, Abraham H. The Farther Reaches of Human Nature. New York: The Viking Press, 1971.

Neisser, U. Cognition and reality: Principles and implications of cognitive psychology. San Francisco: Freeman, 1976.

Proshansky, Ittelson, Rivlin. Environmental Psychology: Man and His Physical Setting. New York: Holt, Rinehart and Winston, Inc., 1970.

Rogers, Everett M., Shoemaker, Floyd F. Communication of Innovations. New York: The Free Press, 1971.

Rokeach, Milton. Beliefs, Attitudes, and Values. San Francisco, CA. Jossey-Bass, Inc., 1968.

Sandman, Peter M., Rubin, David M., Sachsman, David B. Media: An Introductory Analysis of American Mass Communications. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972.

Sandman, Peter M., Rubin, David M., Sachsman, David B. Media Casebook: An Introductory Reader in American Mass Communications. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972.

Sarson, Evelyn. Action for Children's Television: The First National Symposium on the Effect on Children of Television Programming and Advertising. New York: Avon Books, 1971.

Skinner, B.F. Beyond Freedom and Dignity. New York: Alfred A. Knopf, 1971.

Values and Teaching

Barnes, Donald. "Guidelines Paper VI: Teaching Strategies for the Clarification of Values," The Project on Student Values: A Report to Interested Citizens. Grand Rapids, Michigan 1970.

Bauer, Nancy W. "Can You Teach Values?" Instructor, August-September, 1970, pp. 37-8.

Bem, Daryl J. Beliefs, Attitudes, and Human Affairs. Belmont, CA: Brooks-Cole Publishing Company, 1970.

Brown, Ina C. Understanding Other Cultures. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963.

Colby, A. Review of Values and teaching and Values clarification. Harvard Educational Review, February 1975, 45, 134-143.

Disch, Robert (ed.). The Ecological Conscience: Values for Survival. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1970.

Harmin, Merrill, Howard Kirschenbaum and Sidney B. Simon. "Teaching Science With a Focus on Values," Science Teacher, 37 (January, 1970), 16-20.

Hawley, R.C., & Hawley, I.L. Human values in the classroom: A handbook for teachers. New York: Hart, 1975.

Howe, L.W.& Howe, M.M. Personalizing education: Values clarification and beyond. New York: Hart, 1975.

Raths, Louis E., Merrill Harmin and Sidney B. Simon. Values and Teaching. Columbus, Ohio: Charles E. Merrill Publishing Company, 1966.

Simon, Sidney B., Howe, Leland W., Kirschenbaum, Howard. Values Clarification. New York: Hart Publishing Company, Inc., 1972.

Triandis, Harry C. Attitude and Attitude Change. New York: John Wiley & Sons, Inc., 1971.

Zimbardo, Philip and Ebbesen, Ebbe B. Influencing Attitudes and Changing Behavior: A Basic Introduction to Relevant Methodology. Theory, and Applications. Reading, Massachusetts: Addison-Wesley Publishing Company, 1969.

Curriculum Material, Learning Theory, and Instruction

Bennett, Dean. Organization and Operation of the Regional Environmental Education Program. Yarmouth: Yarmouth Public Schools, 1969.

Brennan, Matthew J. People and Their Environment: Eight Curriculum Guides. Chicago: J.G. Ferguson Company, 1969.

Bruner, Jerome S. "The Act of Discovery." Readings in the Psychology of Cognition. Edited by Richard Anderson and David Ausubel. New York: Holt, Rinehart and Winston, Inc., 1965.

Bruner, Jerome. Toward a Theory of Instruction. Cambridge, Mass.: Belknap Press of Harvard University, 1966.

Cox, Benjamin and Byron Massialas, ed. Social Studies in the United States: A Critical Appraisal. New York: Harcourt, Brace and World, 1967.

Cox. The City as a School House. Pennsylvania: Judson Publishers, 1972.

Crow, Lester D., Walter I. Murray, and Hugh H. Smythe. Educating the Culturally Disadvantaged Child. New York: David McKay Co., Inc., 1966.

A Curriculum Activities Guide to Water Pollution and Environmental Studies Vol. I. Institute for Environmental Education, Cleveland Heights, Ohio, 1972.

A Curriculum Activities Guide to Water Pollution and Environmental Studies (Vol. II) Institute for Environmental Education, Cleveland Heights, Ohio, 1972.

Daniels, Philip Bliss. Strategies to Facilitate Problem Solving. Provo, Utah: Brigham Young University, 1964.

Dattner, Richard. Design for Play. New York: Van Nostrand Reinhold Company, 1972.

deCharms, R. Enhancing Motivation: Change in the Classroom. New York: Irvington, 1976.

Duke, Richard D., and Allen N. Schmidt. "Operational Gaming and Simulation in Urban Research." Institute for Community Development. Continuing Education Service, Michigan State University (January, 1965), Bibliography No. 14.

Durkin, Mary C. The Taba Curriculum Development Project in Social Studies. Menlo Park, California: Addison Wesley Publishing Co., 1969.

Eiss, Albert F.; Harbeck, Mary B. Behavioral Objectives in the Affective Domain. Washington, D.C.: National Science Supervisors Association, n.d. 1969.

Flavell, J.H. Cognitive development. Englewood Cliffs, N.J.: Prentice-Hall, 1977.

Fluegelman, A. (Ed.). The New Games Book. Garden City, N.Y. Doubleday, 1976.

Gittell, Marilyn. Educating an Urban Population. California Sage Publ., Inc., 1967.

Hassett, Weisberg. Open Education. Englewood Cliffs, N.J.: Prentice-Hall, 1972.

Hess, Robert D. and Judith V. Torney. The Development of Political Attitudes in Children. Chicago, Illinois: Aldine Publishing Company, 1967.

Holt, John. How Children Fail. New York: Dell Publishing Company, 1964.

Holt, John. How Children Learn. New York: Pitman Publishing Corp., 1967.

Hudgins, Bruce B. Problem Solving in the Classroom. New York: the Macmillan Company, 1966.

Illich, Ivan. Deschooling Society. New York, Evanston, San Francisco, London: Harper and Row Publishers, 1970.

Kagan, Jerome. "A Developmental Approach to Concept Growth." Analysis of Concept Learning. Edited by Herbert Klausmeier and Chester Harris. New York and London: Academic Press, 1966.

Kohl, Herbert R. The Open Classroom. New York: Vintage Books, 1969.

Krathwohl, David R., Benjamin S. Bloom, and Bertram B. Masia. Taxonomy of Behavioral Objectives: Affective Domain. New York: David McKay Co., Inc., 1964.

Langton, Kenneth P. and Kent M. Jennings. "Political Socialization and the High School Civics Curriculum in the United States," American Political Science Review 62. September, 1968.

Lawler, Marcella. Strategies for Planning Curricular Innovation, New York: Teacher College Press, 1970.

Leeper, Robert (ed.). Curriculum Change: Direction and Strategy. Washington: National Education Association, 1966.

Loree, Maurice R. Problem-Solving Techniques of Children in Grades Four Through Nine. University, Alabama: Univ. of Alabama, 1965.

Mager, Robert F. Preparing Instructional Objectives. Palo Alto, Calif.: Fearon Publishers, 1962.

Massialas, Byron. "The School in the Political Socialization of Children and Youth," Education Leadership. October, 1970.

Massialas, Byron. Political Youth, Traditional Schools. Englewood Cliffs. New Jersey: Prentice-Hall, Inc., 1972.

Massialas, Byron and Jack Zevin. Creative Encounters in the Classroom. New York: John Wiley and Sons, 1969.

McInnis, N., & Albrecht, D. (Eds.). What makes education environmental? Louisville: Data Courier, Inc., and Washington, D.C.: Environmental Educators, Inc., 1975.

Miller, Harry L. Teaching and Learning in Adult Education. New York: MacMillan, 1964.

Montague, Earl J. and David P. Butts. "Behavioral Objectives." Science Teacher, 35 (March, 1968), 33-5.

Novak, Joseph. "The Role of Concepts in Science Teaching." Analyses of Concept Learning. Edited by Herbert Klausmeier and Chester Harris. New York and London: Academic Press, 1966.

Oliver, Donald W. and James P. Shaver. Teaching Public Issues in the High School. Boston: Houghton Mifflin Company, 1966.

Peterson, Jensen, Rivers. The Mass Media and Modern Society. Holt, Rinehart and Winston, Inc., 1965.

Piaget, Jean. "How Children Form Mathematical Concepts," Readings on The Psychology of Cognition. New York: Holt, Rinehart and Winston, 1965.

Raths, James; Pancella, John; Van Ness, James S. Studying Teaching. Englewood Cliffs, N.J.: Prentice Hall, 1972.

Reissman, Frank. The Culturally Deprived Child. New York: Harper and Row, 1962.

Ripple, Richard E. and Verne N. Rockcastle. Piaget Rediscovered. Ithaca. New York: Cornell University, 1964.

Sarason, Seymour B. The Culture of the School and the Problem of Change. Boston, Massachusetts: Allyn and Bacon, Inc., 1971.

Saveland, R.N., ed. Handbook of Environmental Education. New York: John Wiley & Sons, Inc., 1976. 267 p. $15.95.

Schmuch, Richard, Mark Chesler and Ronald Lippit. Problem Solving to Improve Classroom Learning. Chicago: Science Research Associates, Inc., 1966.

Schoenfeld, Clay. Outlines of Environmental Education. Madison, Wisconsin: Dembar Educational Research Services, 1971.

Silberman, Charles. Crisis in the Classroom. New York: Random House, 1970.

Smith, B.O., William O. Stanley, and J. Harlan Shores. Fundamentals of Curriculum Development. Revised edition. New York: Harcourt, Brace and World, Inc., 1957.

Stapp, William B. "An Environmental Education Program, (K-12) Based on Environmental Encounters." Environment and Behavior, September, 1971.

Stapp, William B. Integrating Conservation and Outdoor Recreation Into the Curriculum. Minneapolis: Burgess Publishing Company, 1965.

Suchman, J. Richard. "A Model for the Analysis of Inquiry." Analyses of Concept Learning. Edited by Herbert Klausmeier and Chester Harris. New York and London: Academic Press, 1966.

Swan, J.A. & Stapp, W.B. (Eds.) Environmental education: Strategies toward a more livable future. Beverly Hills, Calif.: Sage Publications, 1974.

Taba, Hilda. Curriculum Development: Theory and Practice. New York, Chicago, and Burlingame: Harcourt, Brace and World, Inc., 1962.

Terry, Mark. Teaching for Survival. New York: A Friend of the Earth. Ballantine Book, 1971.

Thorndike, ed. lec. The Teaching of Controversial Subjects: An Anthology of Critical Issues. New York: The Macmillan Company, 1967.

Toffler, A. (Ed.) Learning for tomorrow: The role of the future in education. New York: Vintage Books, 1974.

Troost, Cornelius J., Altman, Harold. Environmental Education: A Source Book. New York: John Wiley & Sons, Inc., 1972.

Travers, Robert M. Essentials of Learning. London: Collier-MacMillan Limited, 1970.

Van Matre, S. Acclimatizing: A personal and reflective approach to a natural relationship. Martinsville, Ind.: American Camping Association, 1974.

Voss, Burton and Stanley Brown. Biology as Inquiry. Saint Louis: The C.V. Mosby Company, 1968.

Wickelgren, W.A. How to solve problems: Elements of a theory of problems and problem solving. San Francisco: Freeman, 1974.

Wittes, Schaible, Chesler, Bryant, Crowfoot. Resources for Social Change II; A Guide for School Administrators. Ann Arbor: The University of Michigan Press, 1972.

Social Change

Alinsky, Saul D. Rules for Radicals. New York: Random House, Vintage Edition, 1971.

Appelbaum, Richard P. Theories of Social Change. Chicago: Markham Publishing Company, 1970.

Bennis, Warren G., Kenneth D. Benne and Robert Chin. The Planning of Change. (2nd Edition). New York: Holt, Rinehart and Winston, 1969.

Beyle, Thad and George Lathrop, Planning and Politics. New York: Odyssey Press, 1971.

Boyer, W.H. Alternative futures: Designing social change. Dubuque, Iowa: Kendall/Hunt, 1975.

Brown, William H. How To Stop The Corporate Polluters: and Make Money Doing It. San Francisco: Bellerophon Books, 1972.

Bryan, William L. "An Identification and Analysis of Power-Coercive Strategies and Techniques Utilized by Selected Environmental Change Agents." Unpublished doctoral dissertation, The University of Michigan, 1971.

Cox, Fred, John Erlich, Jack Rothman, and John Tropman, (eds.) Strategies of Community Organization, A Book of Readings. Itasca, Illinois: R.E. Peacock Publishers, Inc., 1970.

Havelock, Ronald G. A Guide to Innovation in Education. Ann Arbor: Institute for Social Research, The University of Michigan, 1970.

Hillman, Arthur and Frank Seever. "Elements of Neighborhood Organization," Making Democracy Work. National Federation of Settlements and Neighborhood Centers, 1968.

Hoffer, Eric. The Ordeal of Change. New York: Harper and Row, Perennial Library Edition, 1967.

Lee, S. Cognitive mapping research. In B. Honikman (Ed.), Responding to social change. Stroudsburg, Pa.: Dowden, Hutchinson & Ross, 1975.

Love, Sam. Earth Tool Kit: A Field Manual for Citizen Activists. New York: Pocket Books, 1971.

Michael, Donald N. The Unprepared Society: Planning for a Precarious Future. New York: Harper Colophon Books, 1968.

Mitchell, John and Constance Stallings. Ecotactics: The Sierra Club Handbook for Environmental Activities. New York: Pocket Books, 1970.

Morphet, Edgar L., Charles Ryan. Planning and Effecting Needed Changes in Education. New York: Citation Press, 1967.

Nader, Ralph and Ross, Donald. Action for a Change: A Student's Manual for Public Interest Organizing. New York: Grossman Publishers, 1971.

Ross, Arnold M. The Power Structure. New York: Oxford University Press, 1967.

Sax, Joseph. Defending the Environment: A Strategy for Citizen Action. New York: Alfred Knopf, 1970.

Schaller, Lyle E. Community Organization: Conflict and Reconciliation. Nashville, Tennessee: Abingdon Press, 1966.

The O.M. Collective (eds.) The Organizer's Manual. New York: Bantam Books, 1971.

Theobold, Robert. An Alternative Future for America II. Chicago: The Swallow Press, Inc., 1968.

Turner, John B., Editor. Neighborhood Organization for Community Action. New York: New York Association of Social Workers, 1968.

Research

Bloom, Benjamin S., J. Thomas Hastings, George S. Madaus. Handbook on Formative and Summative Evaluation of Student Learning. McGraw Hill, New York, 1971.

Conservation Education Association. Evaluating a Program of Conservation Education in the Elementary School. Conservation Education Association Pamphlet. Danville, Illinois: The Interstate Printers and Publishers, Inc., 1966.

Ebel, Robert L. (ed.). Encyclopedia of Educational Research, 4th edition, MacMillan Company, Collier-Macmillan Limited, London, 1969.

Gage, Ed. Handbook of Research on Teaching. American Education Research Association, 1968.

Grobman, Hulda, "Curriculum Development and Evaluation." Journal of Educational Research, 64:436-442, July-August, 1971.

Hall, Gene E., The Instrument for the Analysis of Science Teaching: A System For Measuring Teaching Behavior, Report Series 19; The University of Texas (Austin), The Researcher and Development Center for Teacher Education, September, 1969.

Hilfiker, Leo R., "Factors Relating to the Innovativeness of School Systems," Journal of Educational Research, 64:23-27, Sept., 1970.

Kahn, Robert L., and Charles F. Cannell. The Dynamics of Interviewing. New York: John Wiley and Sons, Inc., 1966.

Kelly, James G. "Towards an Ecological Conception of Preventive Interventions," Research Contributions from Psychology to Community Mental Health, Jerry W. Carter (ed.), New York, New York: Behavioral Publications, 1968, 76-99.

Kerlinger, Fred N., and Elazar J. Pedhauzer. "Attitudes and Perceptions of Desirable Traits and Behaviors of Teachers." U.S. Department of Health, Education and Welfare, Office of Education, Bureau of Research, Final Report, Project No.5-0330, Contract No. OES-10-024, Sept., 1967.

Lindvall, C.M., Richard C. Cox. The IPI Evaluation Program AERA Monograph Series on Curriculum Evaluation, No. 5, Rand McNally, Chicago, Illinois, 1970.

McGuire, Christine H., and David Babbatt. "Simulation Technique in Measurement of Problem Solving Skills." Journal of Educational Measurement, Vol. 4., No. 1, Spring, 1967.

Merton, Robert, Marjorie Fisk and Patricia Kendall. The Focussed Interview. Glencoe, Illinois: The Free Press, 1959.

Moore, G.T., & Golledge, R.G. (Eds.). Environmental Knowing: Theories, Research, and Methods. Stroudsburg, Pa.: Dowden Hutchinson, & Ross, 1976.

Oppenheim, A.N. Questionnaire Design and Attitude Measurement. New York, New York: Basic Books, Inc., 1966.

Robinson, John P., Phillip R. Shaver (eds.), Measures of Social Psychological Attitudes, Appendix B to Measures of Political Attitudes, Ann Arbor, Michigan. Institute for Social Research, Univ. of Michigan, 1970.

Roth, Robert E. A Review of Research Related to Environmental Education, 1973-1976. Columbus.

Stake, Robert E., (Coord. Ed.,) AERA Monograph Series on Curriculum Evaluation, No. 1, Rand McNally, Chicago, Illinois, 1967.

Webb, Eugene J., D.T. Campbell, R.D. Schwartz, L. Sechrest. Unobtrusive Measures: Nonreactive Research in the Social Sciences, Chicago, Rand McNally, 1970.

Bibliographies Related to Environmental Education

Abelson, Philip H., and Allen L. Hammond, eds. Materials: Renewable and Nonrenewable Resources. Washington, D.C.: American Association for the Advancement of Science, 1976. 198 p. $12.95.

Carvajal, Joan and Munzer, Martha E. Conservation Education: A Selected Bibliography--Supplement. Danville, Illinois: The Interstate Printers & Publishers, Inc., 1971.

Conservation Foundation. Toward Clean Water: A Guide to Citizen Action. Washington, D.C.: The Conservation Foundation, 1976. 328 p.

Coon, Herbert L., and Mary Lynne Bowman. Environmental Education in the Urban Setting: Rationale and Teaching Activities. Columbus, Ohio: ERIC Center for Science, Mathematics, and Environmental Education, The Ohio State University, 1976. 198 p.

Disinger, John F. Environmental Education Information Report: A Directory of Projects and Programs in Environmental Education, Fourth Edition. Columbus, Ohio: ERIC Information Analysis Center for Science, Mathematics, and Environmental Education, The Ohio State University, 1976. 330 p.

Disinger, John F., and Mary Lynne Bowman. Environmental Education Information Report: Environmental Education 1975: A State-by-State Report. Columbus, Ohio: ERIC Center for Science, Mathematics and Environmental Education, The Ohio State University, 1975. 319 p.

Earley, Emily H. A Bibliography of Environmental Periodicals. Madison, Wisconsin: Center for Environmental Communications and Education Studies, The University of Wisconsin--Madison, 1970. (Mimeographed.)

Matthews, William H. Resource Materials for Environmental Management Education. Cambridge, Mass.: The M.I.T. Press, 1976. 259 p. $8.95.

Marlett, Robert, ed. Current Issues in Environmental Education II. Columbus, Ohio: ERIC Center for Science, Mathematics, and Environmental Education, The Ohio State University, 1976. 192 p.

Marlett, Robert, ed. Environmental Education Information Report: Current Issues in Environmental Education-1975. Columbus, Ohio: ERIC Center for Science, Mathematics, and Environmental Education, The Ohio State University, 1975. 113 p.

Russell, Helen Ross. Ten Minute Field Trips Using the School Grounds for Environmental Studies. Chicago: J.G. Ferguson Publishing Company, 1973. 173 p.

Stapp, William B. and Mary Dawn Liston. Environmental Education: A Guide to Information Sources. Detroit: Dale Publishing Company, 1975. p. 225.

Wilson, Thomas W., Jr. Bibliographic Materials on Environmental Affairs. New York: The Anderson Foundation (600 Fifth Avenue, N.Y. 10020), 1970. (Mimeographed.)

American Association for the Advancement of Science. Science for Society--A Bibliography. Washington, D.C.: American Association for the Advancement of Science (Education Department, 1515 Massachusetts Avenue, 20005), 2nd ed., 1971.

Energy

Ashley, Holt, Richard L. Rudman, and Christopher Whipple, eds. Energy and the Environment: A Risk-Benefit Approach. Elmsford, New York: Pergamon Press, Inc., 1976. 304 p. $12.50.

Berkowitz, David A. Power Generation and Environmental Change, MIT Press, 1971.

Coon, Herbert L., and Michele Y. Alexander. *Energy Activities for the Classroom*. Columbus, Ohio: ERIC Center for Science, Mathematics, and Environmental Education, The Ohio State University, 1976. 148 p.

Epstein, Sam, and Beryl Epstein. *Saving Energy*. Champaign, Illinois: Garrard Publishing Co., 1977. 64 p. $4.22.

Garvey, Gerald. *Energy, Ecology, Economy*, W.W. Norton & Co., 1972.

Goffman, John and Tomplin, Arthur. *Poisoned Power*, Rodale Press, 1971.

Healy, Robert G., and Henry R. Hertzfeld. *Energy Conservation Strategies*. Washington, D.C.: The Conservation Foundation, 1976. 50 p. $3.00.

Lowery, Barbara, *Oil*. New York: Franklin Watts, Inc., 1977. 48 p.
Patterson, Walter C. *Nuclear Power*. New York: Penguin Books, 1976. 304 p. $3.50.

Ridgeway, James. *The Last Play*, E.P. Dutton & Co., Inc. 1973.

Schurr, Sam H. *Energy, Economic Growth & the Environment*, Johns Hopkins University Press, 1972.

Wallace, Daniel. *Energy We Can Live With*. Emmaus, Pennsylvania: Rodale Press, 1976. 150 p. $3.95.

Environmental Occupations

Ashford, N. *Crisis in the Workplace: Occupational Disease and Injury*. A Report to the Ford Foundation. Cambridge, Mass.: MIT Press, 1976.

Environmental Protection Agency. *Working Toward a Better Environment: Some Career Choices*. Washington, D.C., Pre-publication print, 1972.

Fanning, Odum. *Opportunities in Environmental Careers*. Vocational Guidance Manual. New York: Universal Publishing and Distributing Corporation, 1971. $5.75.

J.G. Ferguson Company Staff. *Career Opportunities: Ecology, Conservation and Environmental Control*. Chicago: J.G. Ferguson Company, 1971. $6.95.

Olympus Research Corporation for United States. *Career Education and the Environment*. Superintendent of Documents. U.S. Government Printing Office, Washington, D.C. 20204, 1971. $3.00.

Children's Section
(Books for Pre-Schoolers Through 4th Grade on the Environment)

Aliki, Green Grass and White Milk. Thomas Y. Crowell Co., 1974.

Aliki, My Hands. Thomas Y. Crowell Co., 1974.

Baker, Samm Sinclair. The Indoor and Outdoor Grow-it Book. Random House, 1966.

Blough, Glena B. Discovering Cycles. McGraw Hill Book Co., 1973.

Borland, Hal. The World of Wonder. J.B. Lippincott Co., 1973.

Branley, Franklyn M. Oxygen Keeps You Alive. Thomas Crowell Co., 1973.

Chernoff, Goldie Taub. Pebbles and Pods. Scholastic Book Services, 1973.

Gans, Roma. Water for Dinosaurs and You. Thomas Y. Crowell, 1972.

Hawes, Judy. What I Like About Toads. Thomas Crowell Co., 1972.

Hobart, Lois. What is a Whispery Secret? Parents Magazine Press, 1968.

Krauss, Ruth. The Carrot Seed. Scholastic Book Services, 1972.

Miles, Betty. A Day of Autumn. Knopf, 1973.

Miles, Betty. A Day of Spring. Knopf, 1970.

Miles, Betty. Save the Earth--An Ecology Handbook for Kids. Knopf, 1974.

Milgron, Harry. Adventures with a Cardboard Tube. E.P. Dutton and Co., 1972.

Pringle, Laurence. The Only Earth We Have. Macmillan, 1969.

Pringle, Laurence, Twist, Wriggle and Squirm. Thomas Y. Crowell Co., 1973.

Ross, Wilda S. Who Lives in This Log? Coward, McCann & Geoghegan, Inc., 1971.

Selsam, Millicent E. Is This a Baby Dinosaur? Harper and Row, 1971.

Seuss, Dr. The Lorax. Random House, 1971.

Vevers, Gwynne. Birds and Their Nests. McGraw Hill Book Co., 1973.

G. ENVIRONMENTAL MONITORING KITS

BAKER SCIENCE PACKETS - 650 Concord Drive, Holland, Michigan, 49423, "Physical Science Packet." Total of 117 experiments in 11 units, covering teacher demonstrations, student activities and projects. "Nature Study Packets." Total of 166 activities on ecology, conservation, pollution and other environmental problems. Both, grades 1-9. Write for price information.

CAROLINA BIOLOGICAL SUPPLY CO. - Burlington, North Carolina 27215: Ecology Kits designed to construct a well-balanced 1-gallon aquarium and four terraria: bog, carnivorous, woodland and sandhill, $16.00/kit. Live and preserved specimens, chemical sets, dissection mounts, and experimental equipment also available.

EDUQUIP, INC. - The Sippicon Corp., 1220 Adams St., Boston, Mass. 02124: Complete line of air, water and soil pollution test kits, elaborate ecological equipment such as an "ecological chamber," useful in studying effects of various pollutants on plant life, animal life and surface materials such as fabric, paint and rubber. Smog sampling kit, carbon monoxide experiment kit, ozone generator and atmospheric particle detector also available. Prices vary from inexpensive lines up to the high quality and expensive testing equipment.

HACH CHEMICAL CO. - Box 907 Ames, Iowa 50010. Soil and water testing kits available for acidity, alkalinity, dissolved oxygen and phosphate, as examples. From the very simple to the more complex. Moderate pricing.

INSTRUCTOR CURRICULUM MATERIALS - Gimmy and Company, 13131 West McNichols Rd., Detroit, Michigan 48235: "Outdoor Activities for Environmental Studies." Detailed instructions for activities and projects that include measuring horizontal and vertical distances, the secchi disk (for water clarity), measuring ground cover, wind speed and direction slope measurement, moving water, soil compaction and absorption rate, and others. Activities incorporate a multidisciplinary approach. 48 pages. $1.50/book.

J.B. LIPPINCOTT CO.- E. Washington Square, Philadelphia, Pa., 19105, "Life Science: A Search for Understanding" and "Physical Science: A Search for Understanding." A program of human ecology and physical science, respectively. Lab experiments included with each.

LA MOTTE CHEMICAL EDUCATIONAL DIVISION - Chestertown, Maryland 21620. Sampling and measurement equipment for limnology, oceanography, water pollution and soil science studies. Both inexpensive and more elaborate kits available.

MILLIPORE CORP.- Bedford, Massachusetts 01730: "Biological Analysis of Water and Wastewater" catalog. A complete selection of sampling equipment, laboratory preparation and testing apparatus, field testing equipment and analysis kits. Well organized, instructional catalog, complete with glossary-bibliography.

NASCO-STEINHILBER - Fort Atkinson, Wisconsin 53538: "Biological Science Catalog 118" Live specimens including algae; aquarium and terrarium plants; prepared microscopic slides; museum mounts of plants and insects; botanical (herbarium) sheets; nature study aids and replicas such as "trees of your state;" field guides and lesson booklets; instructional botanical models; laboratory equipment; seed germination kits; environmental/ecological lab-packs for determining radiation effects and nitrogen-fixation relationships to plant growth; and an extensive collection of other laboratory materials.

OCEANOGRAPHY UNLIMITED, INC.- 91 Delaware Avenue, Patterson, N.J. 07503: Catalog arranged by: 1) Classroom materials including aquaria, live and preserved marine specimens, globes, models, charts, boards, etc., 2) Laboratory materials, including environmental research kits, seismographs, experiments and fish, 3) Field portion includes water analysis kits, oceanographic field kits, seives, nets, dredges, and other equipment for water sampling. Send for the Educational Catalog.

SCHOOLMASTERS SCIENCE - 746 State Circle, Ann Arbor, Michigan 48104: "Ecology Aids" section includes film and cassette combination with corresponding teacher's manual for air, soil and water pollution. Individual kits: $11.95. Complete set of three kits: $34.95. Biological and chemical water pollution test kits available for $29.95 each. A total of eight water investigations filmstrip/cassette combination and 92 packaged teacher's guide available for $49.95. Air pollution posters available for $2.95/set. Assorted other material pertaining to biological, geological and zoological study also available.

SCIENCE - American Association for the Advancement of Science, J.T. Baker Chemical Co., Phillipsburg, N.J. 08865: "Guide to Scientific Instruments." A complete selection of instruments, equipment and manufacturers essential to scientific testing and experimentation. Highly specialized air sampling and analysis equipment, combustion analysis equipment, nuclear instruments, oceanographic equipment, science teaching equipment and water equipment.

SELECTIVE EDUCATIONAL EQUIPMENT, INC. - 3 Bridge St., Newton, Mass., 02195, "City Ecology." Involves the student in observing, measuring, predicting, etc., of subject matter; includes student activity cards, rain gauges, soil samples and other materials - Grades 4-8. "Illuminated Student Microscope." Low-cost, unbreakable 120x microscope; may also be used as micro-project or water-drop microscope. Other microscopes available from 5x to 40x; also magnifying lenses.

TURTOX PRODUCTS - c/o Crowell, Collier and Macmillan, Inc., 8200 S. Hoyne Avenue, Chicago, Ill. 60620: Biological and botanical supplies including preserved plant and animal specimens, zoological specimens, fossil and mineral charts and specimens, demonstration apparatus for plant parts, and an exclusive selection of microscope slides. Charts, transparencies and Kodachrome slides also available. A wide selection of collecting equipment, moderately priced, is also included.

URBAN SYSTEMS, INC. - 1033 Mass. Ave., Cambridge, Mass. 62138. "Ecology Kits I - VIII (5 and up); kits to teach basic ecological principles; includes vials, seeds, filter and chromotography paper, shrimp, algae, earth substances, chemical reagents and other equipment." Eco Kits I-VIII (4-up)-similar to above kits.

WARD'S NATURAL SCIENCE ESTABLISHMENT, INC. - P.O. Box 1712, Rochester, New York 14603. "Water Pollution Learning System," "Heredity and Environment Kit," "pH measurement/Indicator kit," Plankton tow nets and seive sets and soil sampling sets available. Total section of catalog devoted to environmental kits for water, soil, air and weather.

H. ENVIRONMENTAL GAMES AND SIMULATIONS

BALANCE

Type: Simulation/Role Play
Age: Grade five through college
Time: Three weeks, one hour per day
Cost: $10.00 per kit
Number of Players: Applicable for entire class
Developer: David Yount and Paul Oscock
Source of Purchase: Interact, Box 262, Lakeside, CA 92040

BLIGHT (Urban Ecology)

Type: Kit/Simulation
Age: Middle School through adult
Time: 3-8 hrs.
Cost: $42.50
Number of Players: 20-40
Source of Purchase: Instructional Simulations, Inc., 2147 University Ave., St. Paul, MN 55114

BUSHMAN EXPLORING AND GATHERING

Type: Board game
Age: Fifth Grade
Time: One hour each for two phases
Cost: ?
Number of Players: 4-8
Developer: Abt Associates
Source of Purchase: Educational Development Center, 15 Mifflin Place, Cambridge, Massachusetts 02138

CITIES GAME

Type: Kit/Simulation
Age: High School through adult
Time: 1-2 hours
Cost: Approximately $10.00
Number of Players: 4-16
Source of Purchase: Psychology Today Games, Del Mar, CA 92014 or in your local bookstore or department store.

CLEAN UP

Type: Board Game
Age: 4-10
Time: 1 hour
Cost: $5.00
Number of Players: 2-6
Source of Purchase: Damon Educational Division, 80 Wilson Way, Westwood, MA 02090

CLUG - Community Land Use Game

Type:	Simulation
Age:	College through adult
Time:	6 hours, minimum
Cost:	$75.00 for complete kit
Number of players:	About 15
Developer:	Allan G. Feldt
Source of Purchase:	Urbex Affiliates, Inc., 474 Thurston Rd., Rochester, New York 14619

COMPACTS - Community Planning and Action Simulation

Type:	Simulation
Age:	College through adult
Time:	3 hrs. for 3 days
Cost:	$75.00 for complete kit
Number of Players:	20-60
Developer:	Armand Lauffer
Source of Purchase:	Gamed Simulations, Inc., FDR Station, Box 1747, New York, New York 10022

DIRTY WATER

Type:	Board game
Age:	Junior high through senior high
Time:	1-2 hours
Cost:	$10.00
Number of Players:	2-4, or teams
Developers	Urban Systems, Inc.
Source of Purchase:	Urban Systems, Inc., 1033 Massachusetts Ave., Cambridge, Massachusetts 02138 (or any toy or department store)

ECOLOGY

Type:	Board game
Age:	Junior high through senior high
Time:	One or two hours
Cost:	$10.00
Number of Players:	204, or teams
Developer:	Urban Systems, Inc.
Source of Purchase:	Urban Systems, Inc., 1033 Massachusetts Ave., Cambridge, Massachusetts 02138 (or any toy or department store)

ENERGY/ENVIRONMENT GAME

Type:	Role Play/Simulation
Age:	Middle school through adult
Time:	Minimum of 6 hours
Cost:	?
Number of Players:	35-50
Developer:	Creative Studies, Inc., Boston, Mass. Michigan State University, Science and Mathematics, McDonel Hall, E. Lansing, MI 48823

THE ENVIRONMENT GAME

Type: Simulation/Role Play
Age: Grade 5 through adult
Time: 3-4 hours
Cost: $22.50
Number of Players: Minimum 4; applicable for entire class.
Developer: Paul Twelker
Source of Purchase: Teaching Research, Oregon State System of Higher Education, Monmouth, Oregon 97361

EXTINCTION

Type: Board game
Age: Junior high through senior high
Time: 3 hours minimum
Cost: $11.00
Number of Players: 2-4
Developer: Stephen P. Hubbell (Zoology Dept., Univ. of Michigan, Ann Arbor, Michigan 48104
Source of Purchase: Sinauer Associates, Inc., 20 Second St., Stamford, Connecticut 06905

INDIAN VALLEY

Type: Role Play/Simulation
Age: Grades 7-12
Time: 2-4
Cost: Single copy free; quantity copies $.20 each
Number of Players: Suitable for average size class
Developer: American Forest Institute
Source of Purchase: American Forest Institute, 1619 Massachusetts Ave., N.W., Washington, D.C. 20036

LAND USE GAME

Type: Role Play/Simulation
Age: Grades 5-8
Time: Minimum of 2 hours
Cost: ?
Number of Players: Applicable for average size class
Developer: Education Ventures, Inc.
Source of Purchase: Education Ventures, Inc., 209 Court St., Middletown, Connecticut 06457

LITTERBUG

Type: Board Game
Age: Grades 1-4
Time: Approximately 30-45 minutes
Cost: ?
Number of Players: Class size or smaller
Developer: Urban Systems, Inc.
Source of Purchase: Urban Systems, Inc., 1033 Massachusetts Ave., Cambridge, Massachusetts 02138

LOBBYING GAME

Type: Role Play/Simulation
Age: High School through adult
Time: 2-1/2 - 5 hours
Cost: $50.00 for complete kit
Number of Players: 20-60
Developer: David Williams, Stanley Blostein
Source of Purchase: Game Group II, P.O. Box 2088, Brandeis University, Waltham, MA 02154 or from: Gamed Simulations, Inc., FDR Station Box 1747, New York, New York 10022

MAN AND HIS ENVIRONMENT

Type: Simulation/Role Play
Age: Grade 4 and up
Time: Adjustable from 20 minutes to several days
Cost: Free, to educators
Number of Players: Especially suited for average class size of 30
Developer: Dr. Frank B. Golly, Director of Institute of Ecology, University of Georgia
Source of Information: Any local Coca Cola Bottling Company

NEW TOWN

Type: Role Play/Simulation
Age: College through adult
Time: 1-1/2 hours or more, depending on version played
Cost: ?
Number of Players: 3-20
Developer: Barry Ross Lawson
Source of Purchase: Harvell Associates, Inc., P.O. Box 34, Berkeley Heights, New Jersey 07922

POLICY NEGOTIATIONS

Type: Role Play/Simulation
Age: College through adult
Time: Priming Game - 2-3 hrs.
Re-design Game - 1-many hrs.,
Replay Game - 2-3 hrs.
Cost: $75.00 for complete kit
Number of Players: Minimum of 6; 20-35 optimum
Developer: Frederick L. Goodman
Sources of Purchase: Urbex Affiliates, Inc., 474 Thurston Rd., Rochester, New York 14619

POLLUTION

Type:	Simulation/Role Play
Age:	Elementary School level
Time:	5-15 periods of 45 minutes each
Cost:	?
Number of Players:	5-15, divided into 3-5 teams
Developer:	Abt Associates
Source of Purchase:	Wellesley Schools Curriculum Center, Seawood Road, Wellesley, MA 60611

POPULATION

Type:	Board game
Age:	8-12 grade
Time:	1-2 hours
Cost:	$10.00
Number of Players:	2-6
Developer:	Damon/Education Division
Source of Purchase:	Damon/Education Division, 80 Wilson Way, Westwood, Massachusetts 02090

PREDATOR-PREY

Type:	Board game
Age:	3-8 grade
Time:	1-2 hours
Cost:	$6.00
Number of players:	Small groups of teams
Developer:	Bernice Collins and Steve Katona
Source of Purchase:	Damon/Education Division, 80 Wilson Way, Westwood, Massachusetts 02090

SMOG

Type:	Board game
Age:	Junior High through Senior High
Time:	1-2-1/2 hrs.
Cost:	$10.00
Number of Players:	Minimum, 2-4 or teams
Developer:	Urban Systems, Inc.
Source of Purchase:	Urban Systems, Inc., 1033 Massachusetts Ave. Cambridge, Massachusetts 02138, or any toy or department store.

SQUARE MILE

Type:	Role Play/Simulation
Age:	High School through adult
Time:	1-2 hours over 2-3 days
Cost:	?
Number of Players:	2-4, or teams
Developer:	Milton Bradley Co.
Source of Purchase:	Milton Bradley Co., Springfield, MA

TRACTS (Core city land use)
Type: Simulation/Role Play
Age: High School through adult
Time: 2-8 hours
Cost: $39.00 for complete kit
Number of Players: 20-40
Developer: Instructional Simulations, Inc.
Source of Purchase: Instructional Simulations, Inc., 2147 University Ave., St. Paul, MN 55114

TRANSIT (Urban Transportation)
Type: Simulation/Role Play
Age: High School through adult
Time: 4-10 hours
Cost: $42.50 for complete kit
Number of Players: 20-40
Developer: Instructional Simulations, Inc.
Source of Purchase: Instructional Simulations, Inc., 2147 University Ave., St. Paul, MN 55114

U-DIG (Urban Development Investment Game)
Type: Simulation/Role Play
Age: High School through adult
Time: 3-5 hours
Cost: ?
Number of Players: 4-16 optimum
Developer: Ervin J. Bell
Source of Purchase: Ervin J. Bell, Associate Professor of Design, College of Environmental Design, University of Colorado, Boulder, Colorado.

VALUES IN ACTION
Type: Media kit; deals with values clarification
Age: 4-6 grade
Time: Nine sessions, minimum of 1 hour each
Cost: $99.00
Number of Players: 3-36
Developer: Fannie and George Shaftel
Source of Purchase: Winston Press, 25 Groveland Terr., Minn. Minn. 55403

WALRUS (Water and Land Resource Utilization Simulation)
Type: Simulation/Role Play
Age: High School through adult
Time: 5 hours
Cost: $40.00 for complete kit
Number of Players: 15-30 optimum
Developer: Allan G. Feldt and David Moses
Source of Purchase: Urbex Affiliates, Inc., 474 Thurston Rd., Rochester, New York 14619

WILDLIFE

Type:	Simulation/Role Play
Age:	Grade 5 through adult
Time:	3 hours minimum
Cost:	$15.00
Number of Players	2-6
Developer:	Richard Meier
Source of Purchase:	Berkeley Gaming Project, Institute of Urba and Regional Development, 316 Wurster Hall University of Calif., Berkeley, Berkeley, California 94720

I. SERIES OF PREPARED CATALOGUES AND BIBLIOGRAPHIES

1. COOPERATIVE EXTENSION SERVICE, MICHIGAN STATE UNIVERSITY - E. Lansing, Michigan 48824. Publications available on insects, nutrition, trees, ecology, parks and recreation, wildlife, agriculture, forestry, soil and weather. Send for free catalog or call local extension service office. Inexpensively priced.

2. EDUCATORS PROGRESS SERVICE, INC.- Randolph, Wisconsin 53956: "Educators Guide to free service materials." 1,738 free items for teachers.

3. ECOSOURCE - Janet Woerner, Freeland Community Schools, Freeland, Michigan 48623. Bibliographies of films, literature pamphlets, books and teaching aids. Often evaluated and arranged by topic area. Free.

4. ENVIRONMENTAL ACTION - 1346 Connecticut Ave., N.W., Rm. 731, Washington, D.C. 20036. Publications available. Fine background information. The Case for a Nuclear Moratorium, 1-9, $1.00 ea.; 10-99, $.65 ea.; 100 or more, $.40 ea. Nuclear Information Packet: an overview of nuclear energy controversy in the U.S. Packet contains Case for a Nuclear Moratorium as well as other pamphlets. 1-10, $1.50 ea. packet; 10 or more, $.80 ea. How to Challenge Your Local Utility: an organizing manual for citizens who want to challenge utilities on environmental, consumer and social grounds. 1-9, $1.50 ea.; 10-99, $1.00 ea.; 100 or more, $.75 ea. Do It Yourself Ecology: What the individual can do for ecology in his/her own life. 1-49, $.25 ea.; 50-199, $.20 ea.; 200 or more, $.15 ea. Ecotage! Suggestions as to how corporations can be made to pay for their pollution. $1.25 each.

5. ENVIRONMENTAL AND OUTDOOR EDUCATION MATERIALS, CO. - Dowling, Mich. 49050. Suppliers of books, flash cards, posters, and curriculum guidelines. Send for catalog.

6. ENVIRONMENTAL EDUCATION BOOKS AND MATERIALS - GULL LAKE ENVIRONMENTAL PROJECT - Kellogg Bird Sanctuary, Michigan State University, Augusta, Michigan 49012. Books on birds, environmental education and ecology. Science and Environmental series available. Recommended Ecology and Environmental kits. Also includes overhead transparencies, maps, A.V. kits, charts and flash cards. Inexpensively priced. Send for catalog.

7. ENVIRONMENT INFORMATION CENTER, INC. - 124 E. 39th Street, N.Y., N.Y. 10016. "Buyer's Guide to Environmental Media." Includes books (arranged by subject area), periodicals, directories of resources, films and film distributors. Send for catalog.

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